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SERVICE MANUAL

707
SPECTRUM ANALYZER

REVISION A

AILTECH
A CUTLER-HAMMER COMPANY
FARMINGDALE, NEW YORK 11735
CONTROL

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EAST COAST OPERATION • 815 BROADHOLLOW ROAD • FARMINGDALE, NEW YORK 11735

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FOREWORD

The AILTECH 707 Spectrum Analyzer handbook information is divided into three applicable manuals. These are:

OPERATING MANUAL

Contains general information relating to the operational characteristics of the instrument.

CALIBRATION AND ADJUSTMENT MANUAL

Contains front panel checkout procedures, detailed calibration procedures, and alignment instructions.

SERVICE MANUAL

Contains all information required to service and maintain the instrument. Includes schematic diagrams, troubleshooting procedures, and replaceable parts list.

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AILTECH 707 SPECTRUM ANALYZER

CHAPTER 1
GENERAL INFORMATION

1-1. SCOPE

This manual provides service information for the AILTECH 707 Spectrum Analyzer. Information relative to ordering parts is also included. Separate manuals are provided for the operation and for calibration and adjustment procedures for the Spectrum Analyzer as is explained in the Foreword.

1-2. POWER REQUIREMENTS

The AILTECH 707 Spectrum Analyzer is operated on either 115 or 230 Vac at 50 to 60 Hz. The 115/230-volt slide switch on the rear of the instrument must be in the correct position to avoid damage to the instrument. When shipped, the instrument is set for the line voltage anticipated at the destination. This should be verified before applying power. Fuses should be changed when changing line voltages. The power requirement is about 220 watts.

1-3. GROUNDING REQUIREMENTS

To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground wire.

1-4. PACKAGE DESCRIPTION

The AILTECH 707 Spectrum Analyzer is designed for ease of servicing. All adjustments for calibration and alignment are accessible with top cover removed. All subassemblies have modular construction for easy service and repair.

The Spectrum Analyzer has four principle subassemblies. These are: (1) the display module which can be independently removed through the front panel; (2) the RF deck which swings out from under the unit when the bottom cover is removed; (3) the main frame which houses most video boards, the low voltage power supply, the log IF amplifier; and (4) the front panel and harness assembly. This construction makes all subassemblies accessible to the service personnel. Figure 1-1 shows the location of the subassemblies within the instrument.

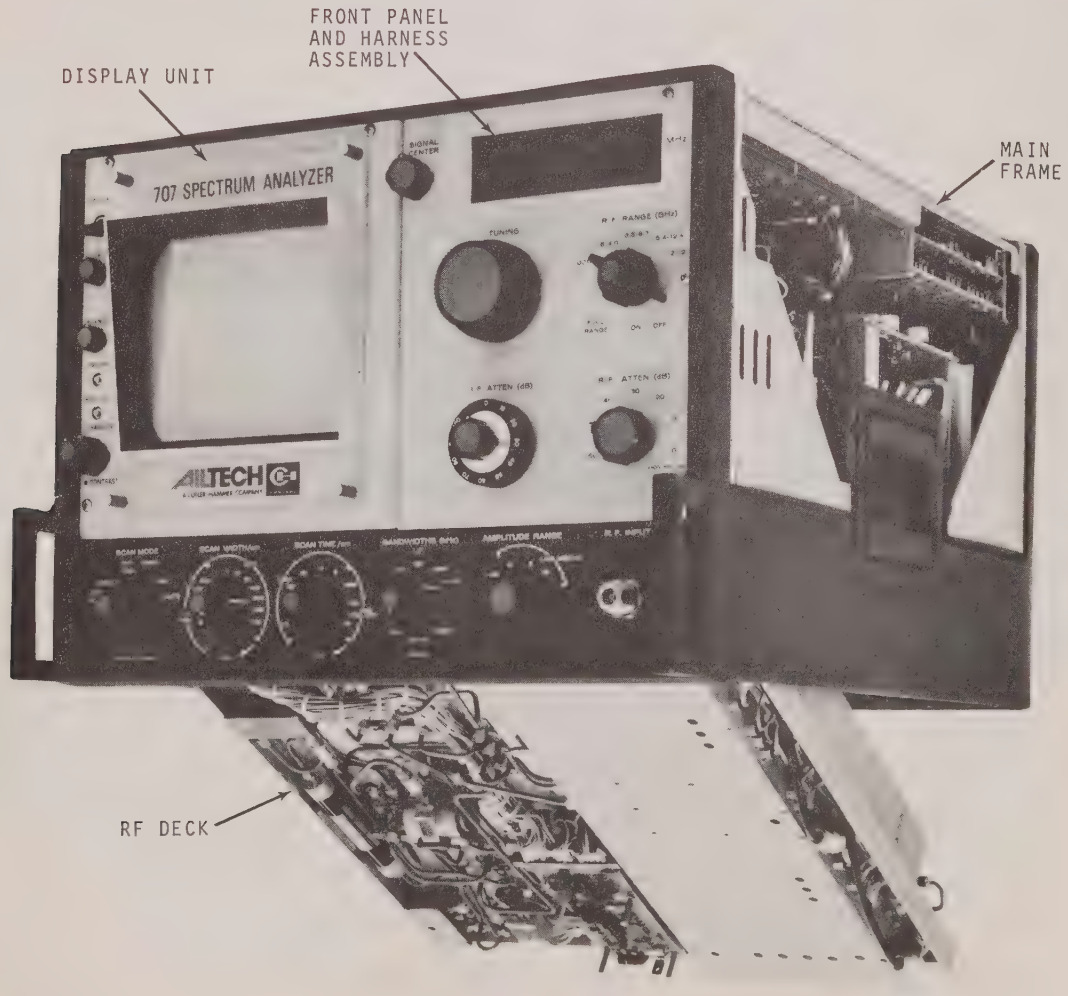


FIGURE 1-1. AILTECH 707 SPECTRUM ANALYZER SUBASSEMBLY LOCATION

CHAPTER 2
THEORY OF OPERATION

2-1. BASIC OPERATING PRINCIPLES

The AILTECH 707 Spectrum Analyzer consists of a superheterodyne receiver and a calibrated CRT display. The receiver may be manually tuned to a fixed frequency or swept tuned through a selected frequency interval. Figure 2-1 is the simplified block diagram of the instrument.

The linear ramp generator provides the horizontal deflection signal for the CRT and the tuning voltages for the preselector and voltage-tuned local oscillator. Shaping circuits in the preselector and voltage-tuned local oscillator ensure that frequency tuning is linear with respect to horizontal deflection of the CRT. These same shaping circuits also ensure that the preselector frequency is maintained at a fixed interval from the voltage-tuned local oscillator frequency, that interval being the first intermediate frequency.

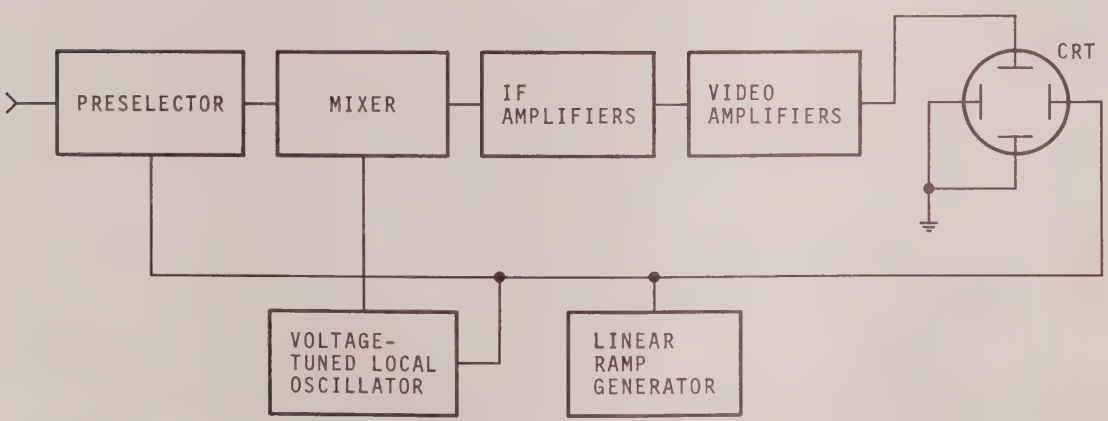


FIGURE 2-1. AILTECH 707 SPECTRUM ANALYZER SIMPLIFIED BLOCK DIAGRAM

When a signal is passed through the preselector, it is mixed with the output of the voltage-tuned local oscillator to provide an output at the intermediate frequency. The signal is amplified, detected, and applied to the vertical deflection plates of the CRT. Since the horizontal deflection is proportional to frequency, the display is a plot of amplitude versus frequency of the applied signal.

2-2. THEORY OF OPERATION

Figure 2-2 is the block diagram of the AILTECH 707 Spectrum Analyzer.

The signal is first applied to the RF attenuator. The RF attenuator provides 60 dB of attenuation in 10-dB steps. It is used to reduce the signal level so that spurious signal generation within the AILTECH 707 is minimized. In general, the signal at the output of the RF attenuator should not exceed -10 dBm. For maximum sensitivity, it is left in the 0-dB position.

Following the RF attenuator is one section of the RF RANGE switch. If the low band (0.001 to 2.0 GHz) is selected, the signal is mixed with the output of the swept VCO and upconverted to 2.29 GHz. The YIG preselector is fixed-tuned to this frequency. The signal is then applied to the high-band mixer and mixed with a crystal-controlled 2060-MHz signal to derive the 227 MHz first intermediate frequency. If any other RF range is selected, the signal is applied directly to the YIG preselector and mixed with the output of the swept VCO in the high-band mixer.

The preselector is a YIG filter capable of being electronically tuned from 1.8 to 12.4 GHz. Shaping and sweep logic circuits in the scan logic ensure that the center frequency of the voltage-tuned local oscillator is always 227 MHz greater than the YIG preselector frequency. The purpose of the YIG preselector is to prevent the generation of on-screen image signals without having to resort to microwave intermediate frequencies.

The VCO is capable of being electronically tuned from 1.7 to 4.3 GHz. When the SCAN WIDTH/cm switch is in a MHz position, the VCO is swept over the selected scan width. When the SCAN WIDTH/cm switch is in a kHz position, the VCO is automatically stabilized and operates at a fixed frequency. Scanning is then done by the 248-MHz oscillator.

After down-conversion, the signal is amplified and applied to the second mixer. This mixer is driven by the 248-MHz oscillator and provides an output at 21.4 MHz. When the SCAN WIDTH/cm switch is in a MHz position, the second LO operates at a fixed frequency. When a kHz scan is selected, this oscillator is swept over the selected interval.

The 21.4-MHz signal is then applied to a signal processor made up of an IF attenuator, an IF bandwidth selector, and an automatic gain compensation network. The attenuator is used to adjust the amplitude of the display. It consists of two sections, one providing 100 dB in 10-dB steps, the other providing 10 dB in 1-dB steps. Four IF bandwidths are provided. These are determined by four sets of filters selectable from the front panel.

The AILTECH 707 Spectrum Analyzer utilizes harmonic mixing to obtain operation at the two higher RF ranges (3.3 to 12.4 GHz). The conversion efficiency of the first mixer is poorer in these harmonic mixing modes than for fundamental mixing. The automatic gain compensation network senses the RF range to which the AILTECH 707 is tuned and inserts or removes attenuation to maintain the overall gain relatively constant with frequency.

Signal amplitudes are usually measured in logarithmic units (dB). Because of this, final IF amplification is provided by a wide-range 21.4-MHz log amplifier. This amplifier employs the successive limiting technique and converts linear IF to logarithmic video. The conversion is such that the amplifier's response is typically within ±2 dB over a full 100-dB dynamic range.

If the AMPLITUDE RANGE switch on the front panel is set to one of the LOG positions, the output of the 21.4-MHz log IF amplifier is applied directly to the video amplifier. However, some measurements are more convenient with a linear display. Placing the AMPLITUDE RANGE switch in the LIN (linear) position routes the signal through a shaping amplifier that restores the linear amplitude response.

Additional filtering is provided in the video amplifier. The signal is then further amplified and applied to the vertical deflection plates of the CRT.

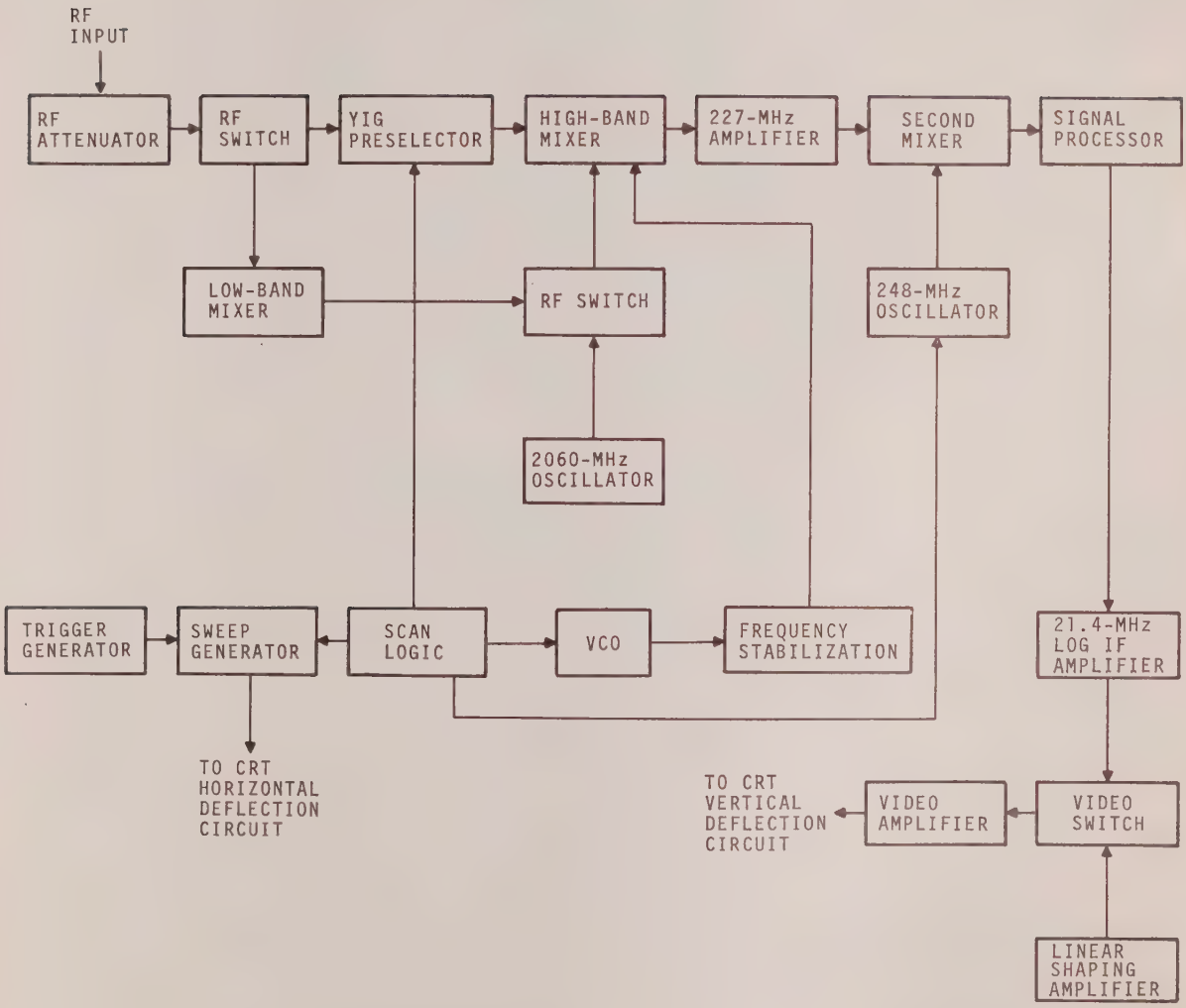


FIGURE 2-2. AILTECH 707 SPECTRUM ANALYZER FUNCTIONAL BLOCK DIAGRAM

CHAPTER 3
TROUBLESHOOTING

3-1. INTRODUCTION

This chapter contains instructions for isolating malfunctions to a general functional area or component of the AILTECH 707. These instructions are based on the assumption that the reader is familiar with the operating procedures for the AILTECH 707 and the test equipment required to perform these procedures. The procedures are designed for a technician who is experienced in the operation and maintenance of this or similar equipment.

3-2. GENERAL INFORMATION

This section contains a functional description of some of the basic components of the AILTECH 707 circuitry. The information contained herein covers the operation of junction transistors, field effect transistors (FET), basic logic circuit elements, integrated circuits, and operational amplifiers. In order to better understand the troubleshooting procedures, it is advisable that this basic information be reviewed before proceeding.

3-3. BASIC JUNCTION TRANSISTOR

The basic junction transistor consists essentially of two PN junctions placed back to back. The transistor is a device that acts as a current amplifier. The three connections to the transistor are the emitter, the collector, and the base. The base region is generally very thin. In operation, the transistor is biased to perform its function. Biasing of the NPN type transistor is shown in Figure 3-1. Biasing of the PNP type transistor is shown in Figure 3-2.

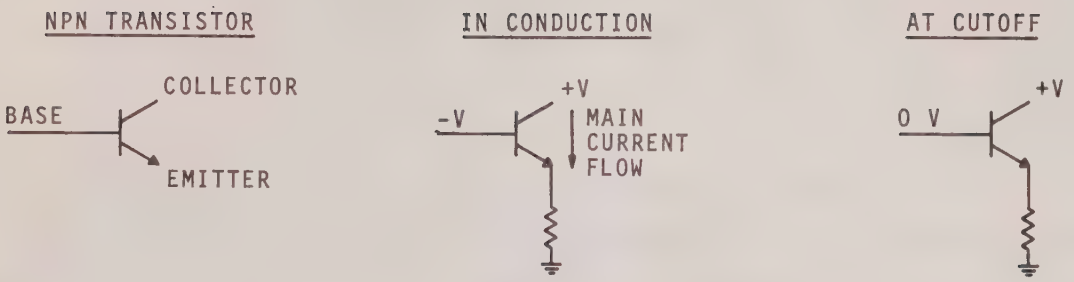


FIGURE 3-1. NPN TRANSISTOR BIASING

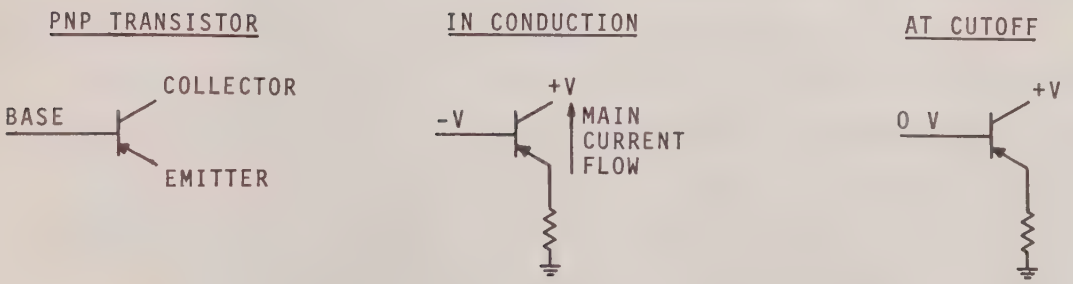


FIGURE 3-2. PNP TRANSISTOR BIASING

The most common cause of transistor failure is internal short circuits or internal open circuits. To check a transistor for shorts or opens, a standard ohmmeter is used. Before checking a transistor with an ohmmeter, be sure to check that the ohmmeter is on the proper scale since most ohmmeters can supply enough current or voltage to damage a transistor. Table 3-1 lists the most commonly available types of ohmmeters and the safe scale settings of each type; these scale settings must be used to aviod damaging the transistor under test.

TABLE 3-1. CHARACTERISTICS OF COMMON OHMMETERS

Make, Model and Range	Open Circuit Voltage	Short Circuit Current	Polarity
Simpson 260			
R × 1	1.5 V	125 mA	Red ⊕
R × 100	1.5 V	1 mA	
R × 10K	7.5 V	60 μA	Black ⊖
Simpson 269			
R × 1	1.5 V	74 mA	
R × 10	1.5 V	8 mA	Red ⊖
R × 100	1.5 V	8 mA	Black ⊕
R × 1K	1.5 V	0.82 mA	
R × 10K	24 V	1.3 mA	
R × 100K	30 V	13 μA	
Triplett 630			
R × 1	1.5 V	320 mA	Red ⊖
R × 10	1.5 V	32 mA	Black ⊕
R × 100	1.5 V	3.25 mA	(Varies with serial number)
R × 1K	1.5 V	325 μA	
R × 100K	22.5 V	70 μA	
Triplett 310			
R × 1	1.5 V	7.5 mA	Red ⊖
R × 10	1.5 V	750 μA	Black ⊕
R × 100	1.5 V	75 μA	(Varies with serial number)
R × 10K	15 V	75 μA	

In addition, the ohmmeter positive and negative probes should be used only as follows:

Transistor Type	Positive Probe	Negative Probe
NPN	Base	Emitter
	Base	Collector
PNP	Collector	Base
	Emitter	Base

The physical configuration of the different types of transistors used in the AILTECH 707 are shown in Figure 3-3.

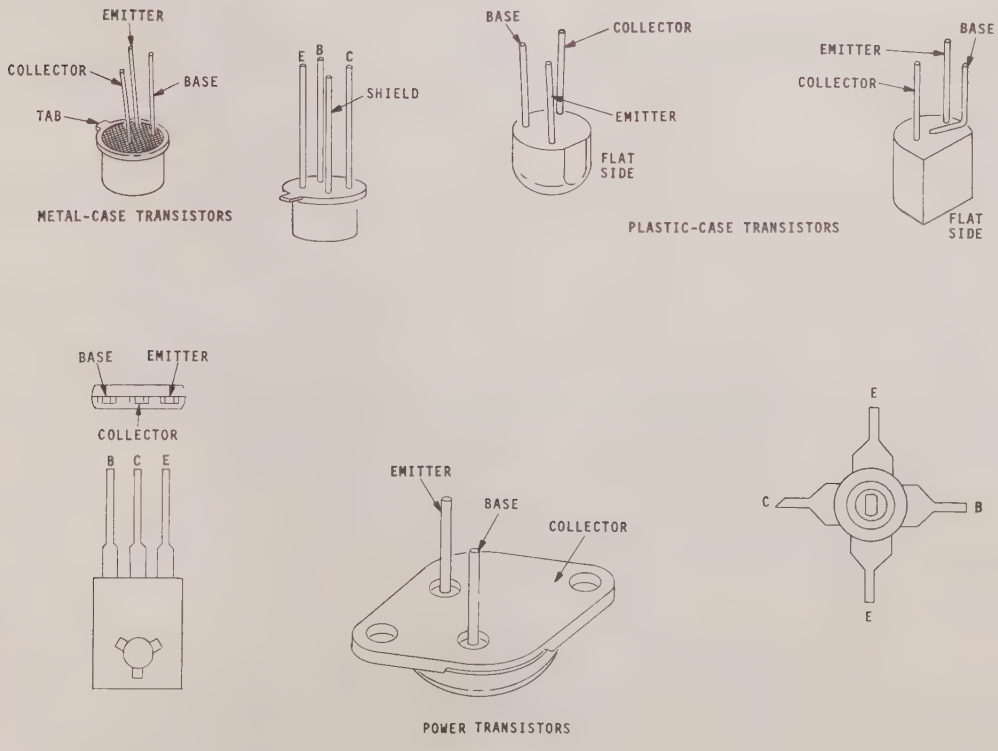


FIGURE 3-3. TRANSISTOR TYPES

3-4. FIELD EFFECT TRANSISTOR

The field effect transistor (FET) is a voltage-sensitive device which has an extremely high input impedance. Field effect transistors have three elements: the source, the drain, and the gate (Figure 3-4). The conducting path between the source and the drain is called the channel. By placing a small positive potential on the drain, electrons will flow from the source to the drain. Therefore, the current flow will be from drain to source. Varying the gate voltage will result in a similar variation in channel width and resistance. Thus, it is the gate voltage variation that causes a change in the current drain, making the FET a voltage-sensitive device.

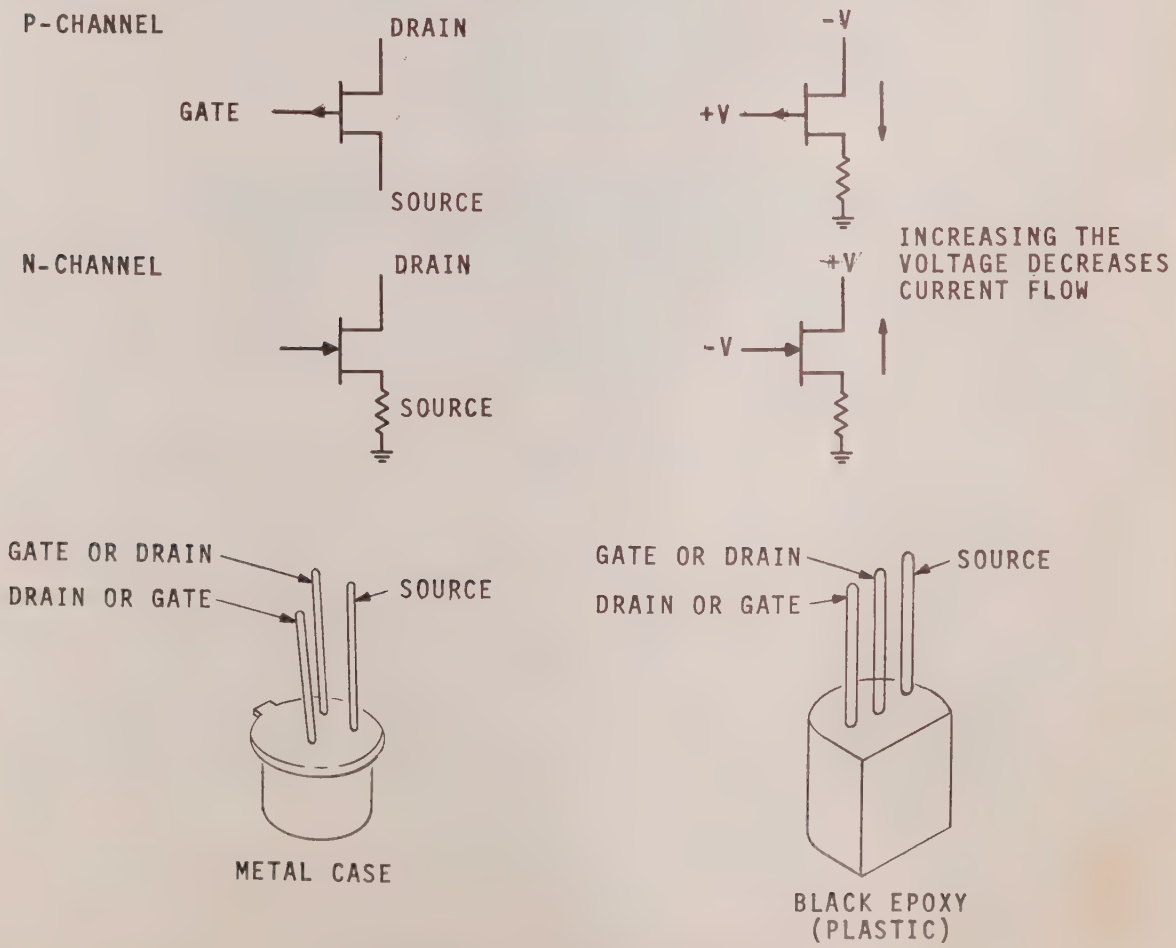


FIGURE 3-4. FET BIASING

3-5. BASIC LOGIC ELEMENTS

The two most basic forms of logic elements are the AND and OR gates. These are shown below with their respective truth tables.

AND

Z = XY

X	Y	Z
H	H	H
H	L	L
L	H	L
L	L	L

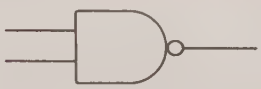
OR

Z = X+Y

X	Y	Z
H	H	H
H	L	H
L	H	H
L	L	L

A NAND gate is an AND gate with its output inverted. Similarly, an OR gate becomes a NOR gate when its output is inverted. The same effect can be accomplished by inverting the inputs of each. To illustrate inversion or the input or output levels schematically, a circle is added to the appropriate line. For example:

AND Becomes NAND (NOT AND)



OR Becomes NOR (NOT OR)

Typical NAND and NOR gates are shown below with their respective truth tables.

NAND

$Z = \overline{X \cdot Y}$

X	Y	Z
H	H	L
H	L	H
L	H	H
L	L	H

NOR

$Z = \overline{X + Y}$

X	Y	Z
H	H	L
H	L	L
L	H	L
L	L	H

An inverter performs a logic level inversion of its input signal. A one-input inverter is shown below with its truth table.

X	Z
H	L
L	H

3-6. INTEGRATED CIRCUITS

Basic logic gates are grouped in various combinations to form integrated circuit chips. Figure 3-5 shows the physical configuration of some typical integrated circuit chips used in the AILTECH 707.

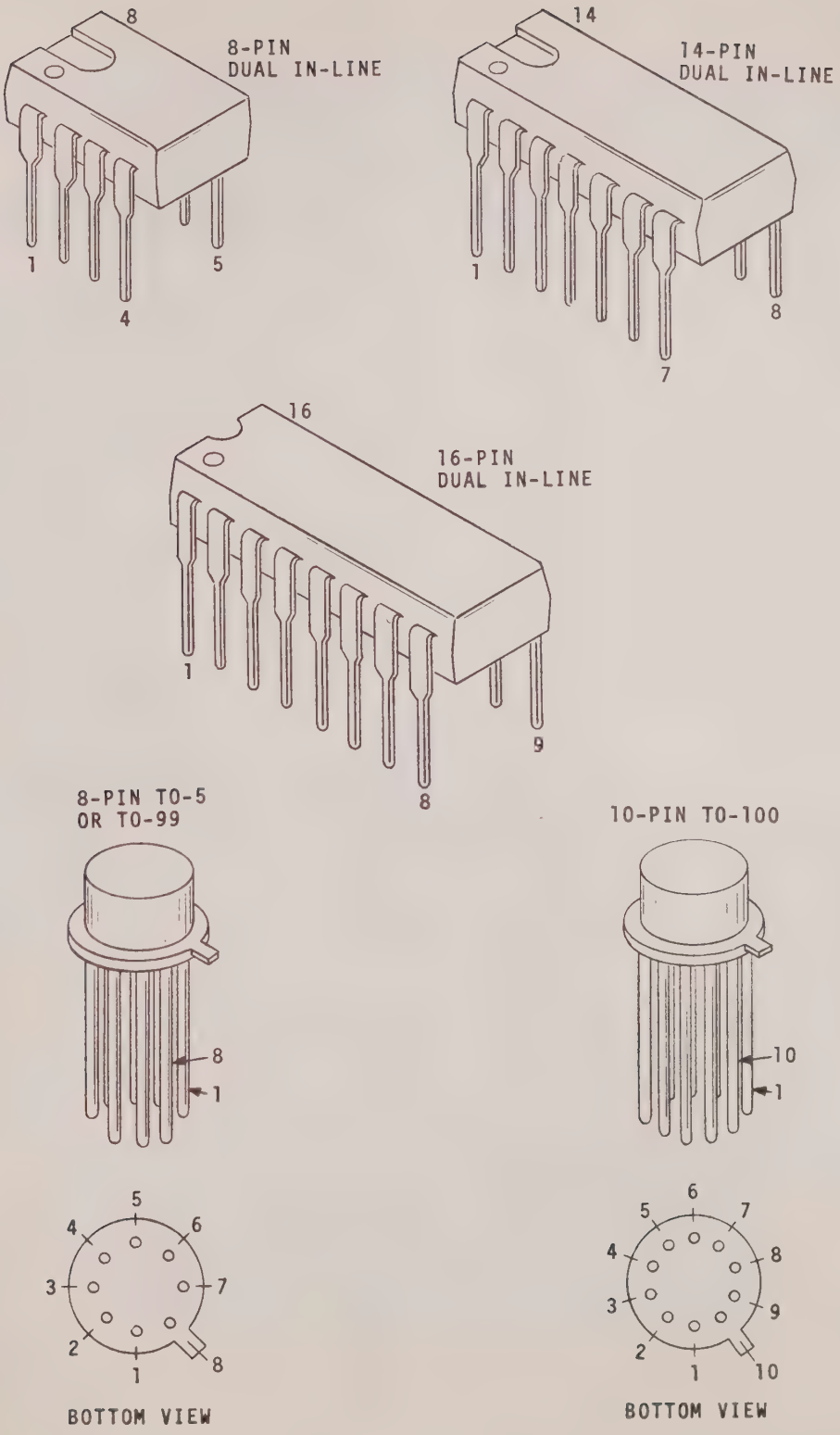


FIGURE 3-5. INTEGRATED CIRCUIT CHIPS

3-7. OPERATIONAL AMPLIFIERS

Operational amplifiers are used to implement several functions. They are used as summers, regulators, buffers, and offset amplifiers. Figure 3-6 shows some general examples of the use of operational amplifiers.

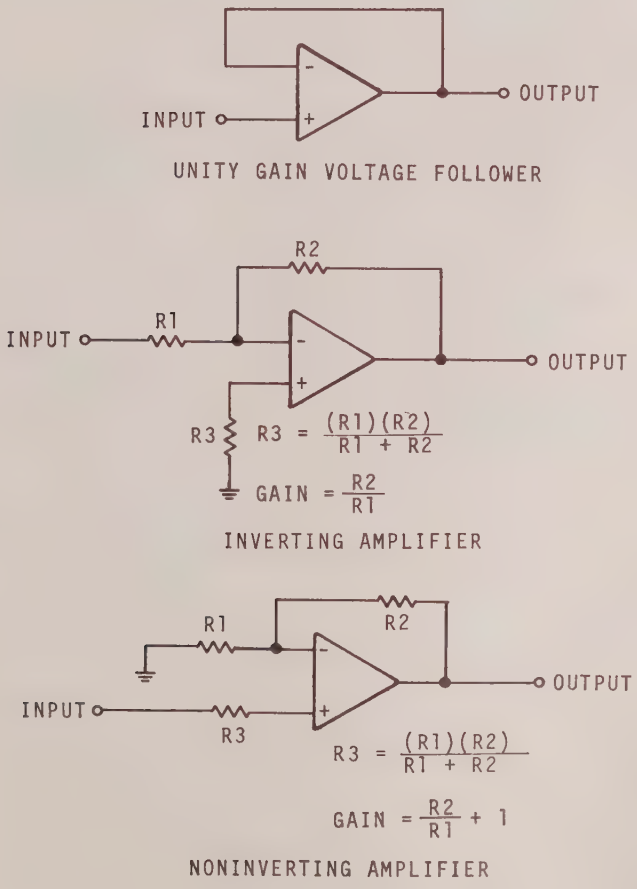


FIGURE 3-6. TYPICAL APPLICATIONS OF OPERATIONAL AMPLIFIERS

3-8. FAULT ISOLATION PROCEDURES

Fault isolation procedures for the AILTECH 707 consist of a complete checkout of the instrument under normal operating conditions. Standard laboratory test equipment is utilized throughout the procedures. Reference should be made to Chapter 4 of this manual for location of parts and test points, as well as for schematic diagrams of the instrument. Detailed procedures for fault isolation must be performed in the sequence given except where otherwise specified.

3-9. TEST EQUIPMENT REQUIRED

The test equipment required for troubleshooting the AILTECH 707 is listed in Table 3-2. Equivalent equipment may be used unless otherwise specified.

TABLE 3-2. TEST EQUIPMENT REQUIRED

Equipment	Identification
100-MHz Comb Generator	AILTECH 707-90
Oscilloscope	Tektronix 502*
Signal Generator	Logimetrics 921A
Signal Generator	Logimetrics 750
Signal Generator	Hewlett-Packard 8616A
Power Meter	Boonton 42A
Frequency Meter	Hewlett-Packard 536A
Frequency Meter	Hewlett-Packard 537
Digital Voltmeter	Systron Donner 7004
Oscilloscope	Tektronix 454

* No equivalent equipment recommended.

3-10. PRELIMINARY PROCEDURES

a. Connect the AILTECH 707 to 115 or 230 Vac as required. Check that the rear panel LINE VOLTAGE SELECT switch is in the correct position and the correct fuses are in place for the line voltage in use.

b. Set the AILTECH 707 controls and switches as follows unless otherwise indicated in text.

Switch	Setting
R. F. RANGE (GHz)	1.8-4.0
FULL RANGE	OFF
R. F. ATTEN (dB)	0
I. F. ATTEN (dB)	10
TUNING	3000 MHz
SCAN MODE	AUTO
SCAN WIDTH/cm	100 MHz
SCAN TIME/cm	3 msec
BANDWIDTHS (kHz) I. F.	AUTO
BANDWIDTHS (kHz) VIDEO	AUTO
AMPLITUDE RANGE	10
POWER	ON (up position)

3-11. AC AND DISPLAY UNIT CHECKOUT

Perform a checkout of the ac input, the power supplies, and the display unit as described in the flow chart of Figure 3-7 and the accompanying instructions. The numbers shown in the upper left corner of the instruction boxes of the flow chart refer to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

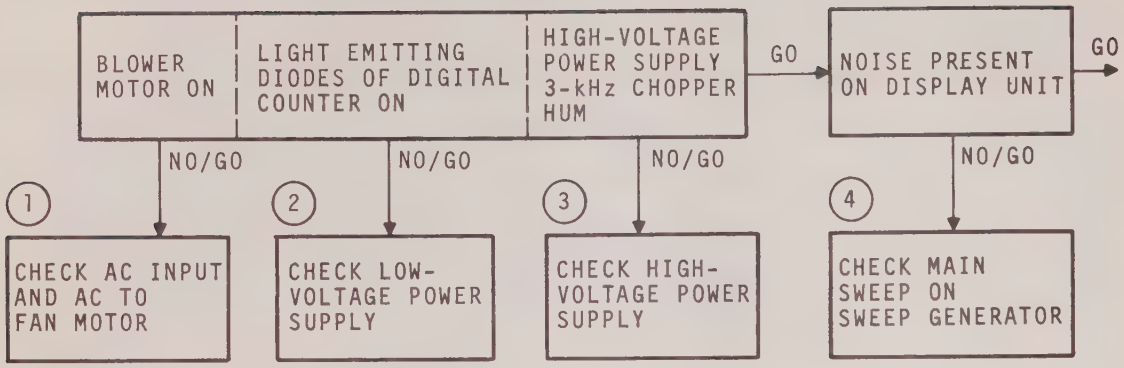


FIGURE 3-7. POWER SUPPLIES AND DISPLAY UNIT CHECKOUT

(1) AC CHECK

At initial turn on, listen for the sound of the blower motor. If it is not on, check the two fuses on rear panel (Figure 4-22) and the ac connection from the power supply distribution board (Figure 4-20) to the fan motor.

(2) LOW VOLTAGE CHECK

Check to see if the light emitting diodes of the digital display (230329) are on. If not, check the low-voltage power supply (230426) (Figure 4-20) for the appropriate voltages: +24 Vdc, +18.2 Vdc, -18.0 Vdc, and +5 Vdc.

(3) HIGH VOLTAGE CHECK

Listen for the hum of the 3-kHz chopper. If the hum is not present, check the high-voltage power supply (230517) (Figure 4-25) as follows:

a. Check the graticule light visually. If it can attain full brilliance, it can be assumed that +24 V is present.

b. Listen for the 3-kHz chopper hum. If it is not audible, the input circuit (Figure 4-25) is at fault. Check the voltage level on the base of Q1 and Q2. A 2-Vdc level indicates that these transistors are defective.

c. If the 3-kHz chopper hum is audible but there is still no display on the CRT, check that the voltage across R29 is less than 0.25 V. If it is, turn the AILTECH 707 power off and clip a jumper across R28. Turn the power on. If the intensity on the CRT returns, check CR14 and CR15. If the intensity does not return, check Q5, Q6, and Q7. Turn the AILTECH 707 power off and remove the jumper.

(4) NO NOISE OR LOW LEVEL NOISE

If noise is not present on the CRT, check that the reference sweepout signal on the J1 sweep generator board (230216) is as shown in Figure 4-16, waveshape (5) . If the waveshape is not as shown and there is just a dot in the center of the CRT, +6 V reference is probably at fault. Check that the ±6 V reference on the J9 preamplifier board (230480) (Figure 4-19) is working properly. The dot may also be caused by defective Q7 and Q8 transistors on the J18 YIG driver board (230547) (Figure 4-33). To check these two transistors, reduce the SCAN WIDTH/cm switch setting to 300 kHz/cm. If the noise is now present, this verifies that Q7 and Q8 are shorted and both should be replaced. If, however, the dot is still present, check the horizontal and vertical deflection on the deflection amplifier (230319) (Figure 4-27). If the deflection amplifier is working properly, recheck the low-voltage power supply for a low voltage.

3-12. RF AND IF SECTION CHECKOUT

Perform a checkout of the RF and IF section as described in the flow chart of Figure 3-8 and the accompanying instructions. The numbers shown at the upper left corner of the instruction boxes of the flow chart refer

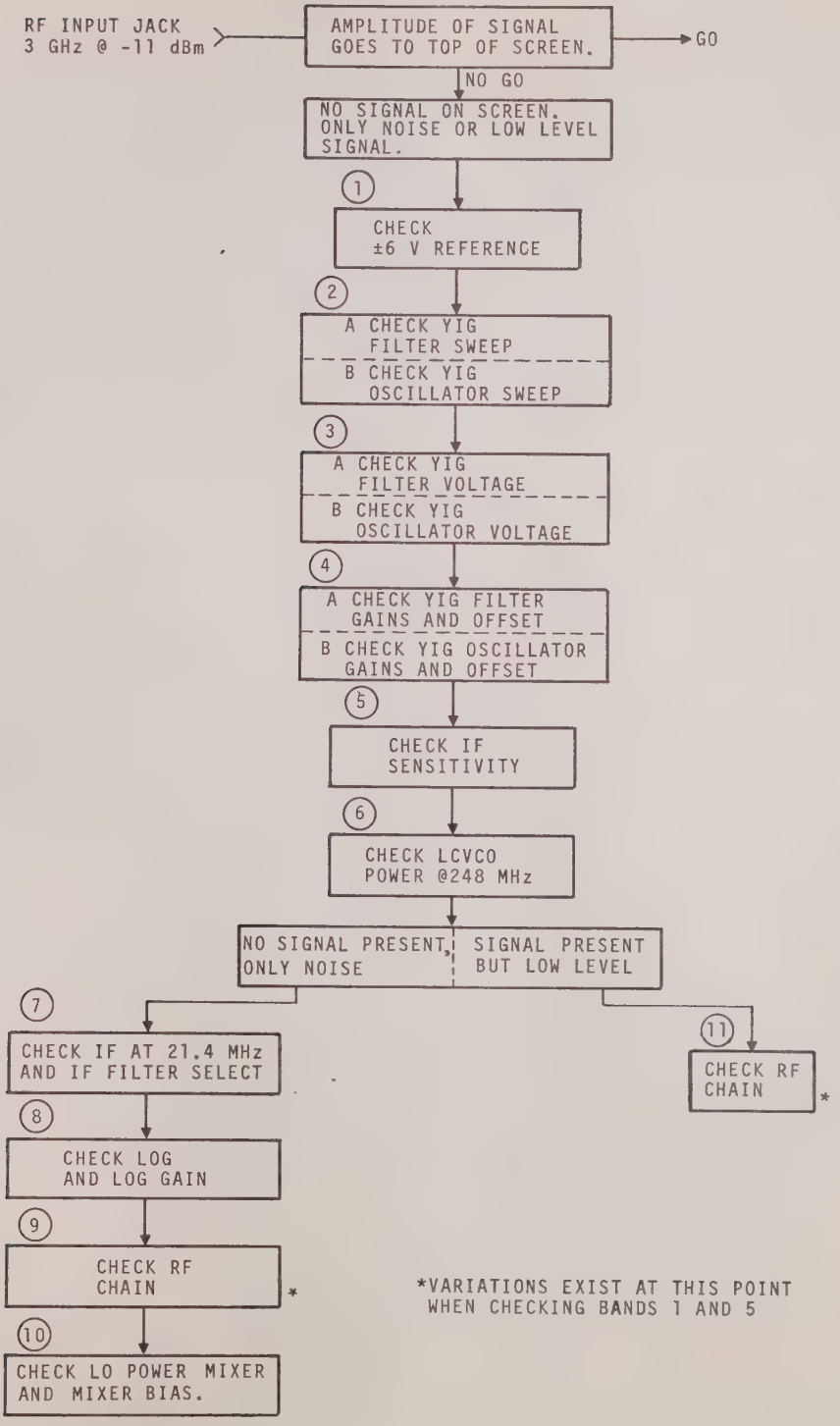


FIGURE 3-8. RF AND IF SECTION CHECKOUT

to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

(1) ±6 REFERENCE CHECK

The +6 V reference is located on the J4 preamplifier board (230480) (Figure 4-19). The +6 V reference can be conveniently measured at the cathode of CR6 while the -6 V reference can be measured at the anode of CR7. If necessary, adjust the +6 V reference by adjusting R34 to +6.000 ±0.005 Vdc. The -6 V reference can be adjusted by varying R31 such that at final setting it reads -6.000 ±0.005 Vdc.

(2A) YIG FILTER SWEEP CHECK

Check the YIG filter signal at pin 5 of the J18 YIG driver (230547) for waveshape (4) of Figure 4-33. If it is not present, check for correct filter gain at pin 4 (waveshape (9) of Figure 4-33). If the input is not correct, check the YIG sweep at pin R of the J1 sweep generator board (230216) for waveshape (6) of Figure 4-16. (This is where the YIG sweep is generated.)

(2B) YIG OSCILLATOR SWEEP CHECK

Check the VCO tune signal at pin 15 of the J18 YIG driver (230547) for waveshape (6) of Figure 4-33. If it is not present, check the VCO gain at pin B for waveshape (8) of Figure 4-33. If the input is not correct, check the YIG sweep at pin R of the J1 sweep generator board (230216) for waveshape (6) of Figure 4-16. (This is where the YIG sweep is generated.)

(3A) YIG FILTER VOLTAGES CHECK

Check the YIG filter (230187) (Figure 4-28) for +24 Vdc on pin 2 and +24 Vdc return on pin 3. This is the heater control voltage. Pin 1 is the plus filter drive and pin 4 is the minus filter drive.

(3B) YIG OSCILLATOR VOLTAGES CHECK

Check the YIG VCO (230186) (Figure 4-28) for +18 Vdc on pin 7 and -5.00 ±0.010 Vdc on pin 2. In addition, check for the presence of the plus and minus FM tune signals on pins 3 and 4 and VCO drive signal on pins 5 and 6.

(4A) YIG FILTER OFFSET AND GAIN ADJUSTMENT CHECK

The YIG FILTER OFFSET and GAIN adjustment potentiometers are located on the R. F. RANGE (GHz) switch (230334) (Figure 4-5). See Figure 3-9 for adjustment locations. The band 2 (1.8 - 4.0 GHz) FILTER OFFSET potentiometer is R47. The YIG FILTER GAIN potentiometer is R20. Refer to the AILTECH 707 Calibration and Adjustment manual for the adjustment procedure and for the proper final settings of these potentiometers.

(4B) YIG VCO OFFSET ADJUSTMENT CHECK

The YIG VCO OFFSET potentiometers are located on the R. F. RANGE (GHz) switch (230334) (Figure 4-5). See Figure 3-9 for adjustment locations. The band 2 (1.8 - 4.0 GHz) VCO OFFSET potentiometer is R32. By varying this potentiometer, the frequency of the VCO can be shifted. Refer to the Calibration and Adjustment manual for the adjustment procedure and final setting of this potentiometer.

(5) IF SENSITIVITY CHECK

To check the IF sensitivity, disconnect the 227-MHz band-pass filter and the mixer bias. Inject a 227-MHz at -10 dBm signal into the 227-MHz band-pass filter (230189-1) (Figure 4-28) see point (D) of the block diagram (Figure 3-11). The noise level should rise to the top of the screen. Reduce the injected signal until the noise no longer moves when the signal is varied; this should be at approximately

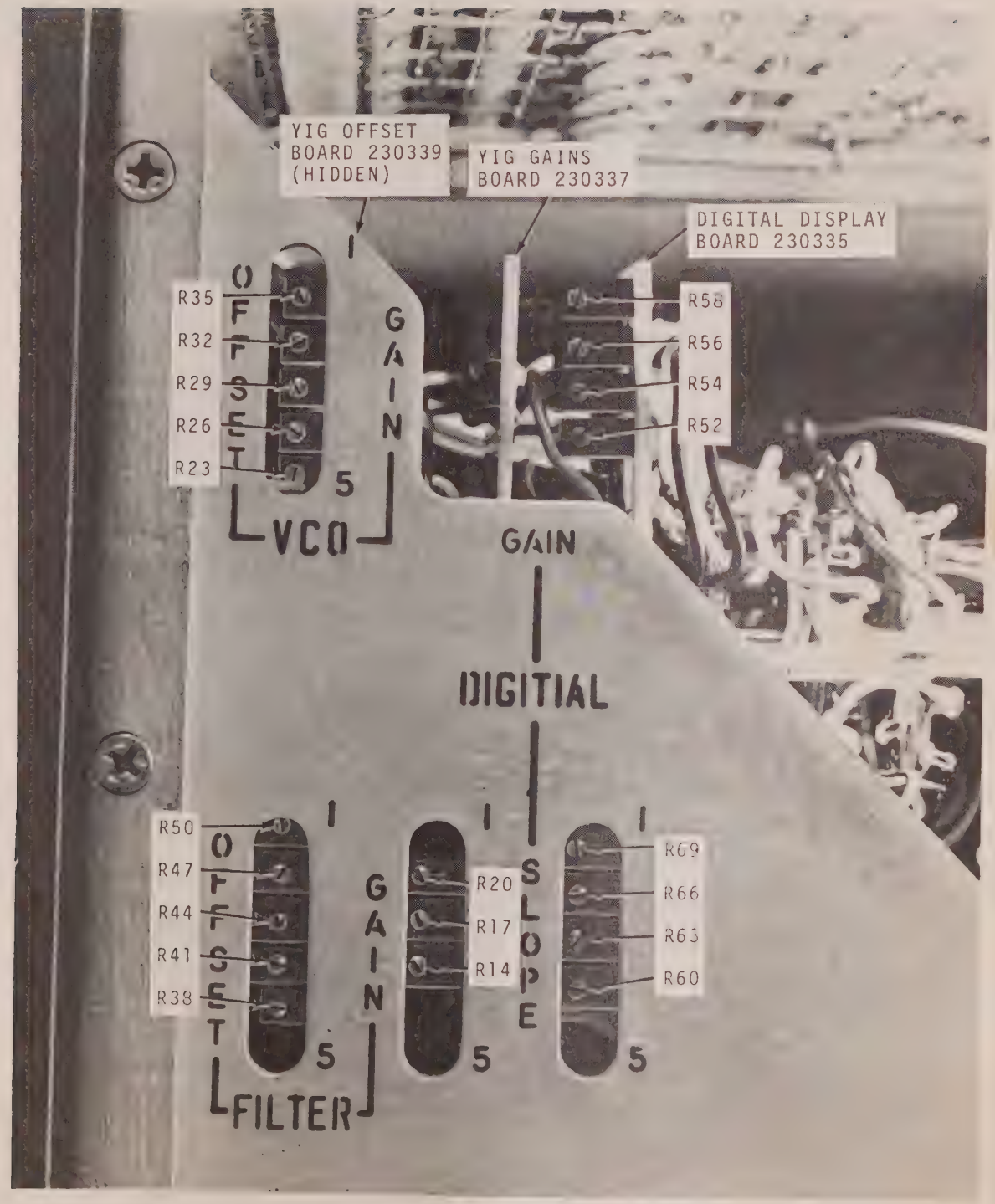


FIGURE 3-9. R.F. RANGE (GHz) SWITCH (230334) ADJUSTMENT LOCATIONS

-105 dBm. Reconnect the 227-MHz band-pass filter and the mixer bias (230500) after completion of this test.

(6) LCVCO ASSEMBLY CHECK

Check the 248-MHz power out of the LCVCO assembly (230543) (Figure 4-36). The power should be approximately 0 dBm at the 248 MHz TEST port.

(7) IF AT 21.4 MHz CHECK

The 248-MHz and the 227-MHz signals are mixed in the IF assembly (230391) to generate the 21.4-MHz IF. To check the IF, jump the cables that are connected to the PROCESSOR INPUT and PROCESSOR OUTPUT (Figure 4-29). Use a signal generator to inject 227 MHz into the RF INPUT of the IF mixer (230394) and measure the IF sensitivity by varying the RF attenuator of the signal generator. The sensitivity should be approximately -100 dBm. This will isolate the IF problem. With the PROCESSOR INPUT and PROCESSOR OUTPUT cables reconnected to the IF assembly, inject 21.4 MHz into the IF OUTPUT cable (Figure 4-29) of the IF attenuator (230473) and measure the sensitivity. It should be approximately -100 dBm. Reconnect cables.

(8) IF AND LOG/LOG GAIN CHECK

Verify the operation of the log IF by injecting a 21.4-MHz signal into the 21.4 INPUT connector on the rear panel (Figure 4-22). Measure the sensitivity at this point; it should be approximately -105 dBm. In addition, verify the operation of the log gain circuitry on the J4 preamplifier board (230480) (Figure 4-19). Log output voltage should be within the range of +3.2 to +5.6 Vdc.

(9) and (11) RF CHAIN CHECK

Check the RF chain by signal injection through the chain to fault isolate to any one component using the values found on Figure 3-11.

NOTE

In band 1 (0.001 - 2.0 GHz) the impedance from the RF input to the band 1 mixer with 0 dB on the IF and RF attenuator should be approximately 10 ohms to ground.

The overall gain in band 2 (1.8 - 4.0 GHz) should be approximately 11 ±7 dB. This gain is measured at 3000 MHz with the AILTECH 707 set as follows:

SCAN TIME/cm	100 μsec/cm (signal peaked)
R. F. ATTEN	0 dB
I. F. ATTEN	0 dB
SCAN WIDTH/cm	<3 MHz/cm
BANDWIDTHS (kHz) I. F.	1000 kHz

In addition, the band 2 VSA should be 16 dB referenced to band 4 (5.4 - 12.4 GHz). With a power meter connected to the rear panel 21.4 OUTPUT jack, inject a signal into the R. F. INPUT jack with sufficient power such that the power meter reads 0 dBm. At each measurement the response should be peaked by tuning the AILTECH 707. Table 3-3 shows point-to-point gain at 3 GHz. Table 3-4 shows the correct signal levels through the RF chain.

TABLE 3-3. GAIN

Figure 3-11 Test Points	
(A) to (B)	-2.0 ±0.5
(B) to (C)	-7.0 ±1.5
(C) to (D)	-9.5 ±1.0
(D) to (D')	-2.5 ±0.5
(D') to (E)	+13.0 ±1.0
(E) to (G)	-3.0 ±1
(G) to (H)	+22.0 ±2
(A) to (I)	+11.0 ±7

TABLE 3-4. SIGNAL LEVELS

Figure 3-11 Test Point	
(A)	-11.0 dBm ±7.0 at 3 GHz
(B)	-13.0 dBm ±7 at 3 GHz
(C)	-20.0 dBm ±5.5 at 3 GHz
(D)	-29.5 dBm ±4.5 at 227 MHz
(D')	-32.0 dBm ±4 at 227 MHz
(E)	-19.0 dBm ±3 at 21.4 MHz
(G)	-22.0 dBm ±2 at 21.4 MHz
(H)	0 dBm at 21.4 MHz
(I)	0 dBm at 21.4 MHz

If the unit has the correct overall gain, the sensitivities should be correct. Table 3-5 shows the correct sensitivities at each point in the RF chain.

TABLE 3-5. TYPICAL RF SENSITIVITIES

Figure 3-11 Test Point	Typical Sensitivity	Frequency
(A)	-85 dBm	3 GHz
(B)	-87 dBm	3 GHz
(C)	-94 dBm	3 GHz
(D)	-103.5 dBm	227 MHz
(D')	-106 dBm	227 MHz
(E)	-99 dBm	227 MHz
(E')	-107 dBm	21.4 MHz
(G)	-107 dBm	21.4 MHz
(I)	-100 dBm	21.4 MHz

The oscillator power levels are given on the block diagram (Figure 3-11).

(10) LO POWER AND MIXER BIAS

Check that there is sufficient LO power and that the mixer bias is getting sufficient voltage. Refer to the system block diagram (Figure 3-11) for appropriate levels.

NOTE

When checking band 1, follow a similar procedure; however, note that in band 1 there is additional circuitry and no sweep present on the YIG filter.

(11) RF CHAIN (See (9) above)

3-13. PHASE LOCK LOOP CHECKOUT

Perform a checkout of the phase lock loop as described in the flow chart of Figure 3-10 and the accompanying instructions. The numbers shown at the upper left corner of the instruction boxes of the flow chart refer to the accompanying instructions which are similarly numbered. Each instruction explains in detail the operations to be performed for that instruction box.

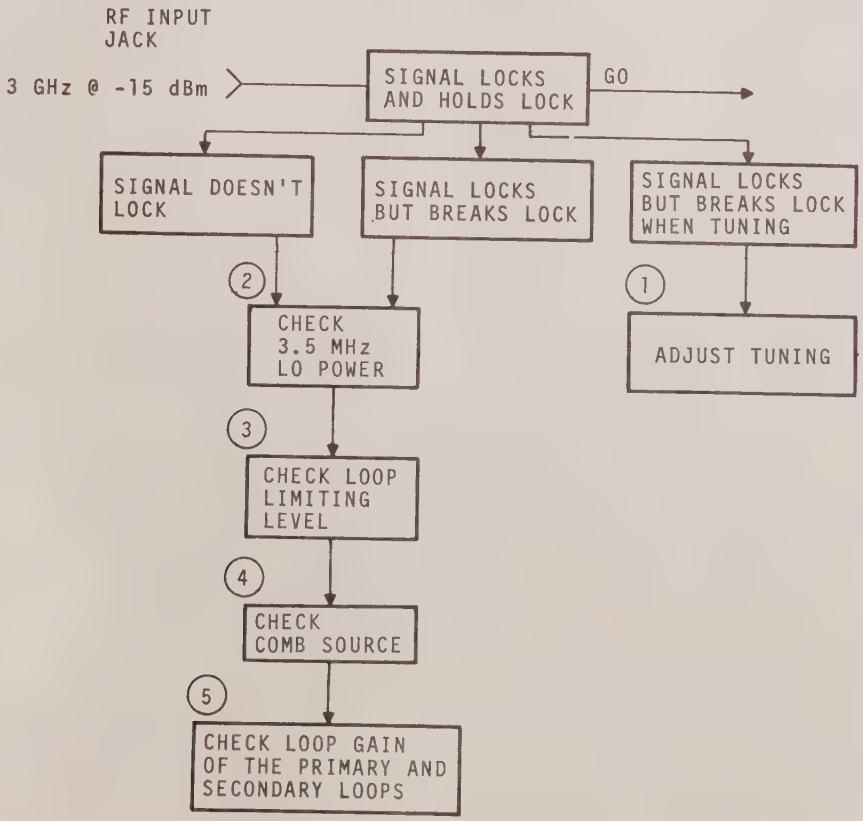


FIGURE 3-10. PHASE LOCK LOOP CHECKOUT

(1) SIGNAL BREAKS LOCK ONLY WHEN TUNING

If the signal breaks lock only when tuning, the problem may be that the coarse tuning potentiometer is moving with the fine tuning potentiometer. This can be corrected by loosening the belt pressure on the coarse tuning potentiometer such that it does not move when the unit is in phase lock. (Phase lock is achieved at a scan width of 300 kHz or less.) The tuner assembly (230275) (Figure 4-14) is located directly below the digital display. R1 is the coarse tuning potentiometer and R2 is the fine tuning potentiometer. In addition, on the shaft there are two cork bushings held in place by the gearing and two metal bushings. It may be necessary to adjust the two metal bushings such that only the fine tuning moves when the SCAN WIDTH/cm switch S1 is in the 300 kHz/cm position.

(2) 3.5-MHz LO POWER CHECK

Check to see if the oscillator is operating properly by checking the power output and the frequency of the oscillator. The frequency should be 3.5 MHz at approximately +7 dBm.

(3) LOOP LIMITING LEVEL CHECK

With the SCAN WIDTH/cm switch S1 set to 300 kHz/cm, inject a 3.5 MHz signal into the SIGNAL IN port of the loop assembly (230392) (Figure 4-39). Using another spectrum analyzer and a scope probe on the IF test point (Figure 4-41), beat the external 3.5 MHz signal against the internal 3.5 MHz signal to center the signal generator. Remove the internal 3.5 MHz signal by removing the cable from the 3.5 MHz oscillator to the 3.5 MHz input to the loop. Measure the loop limiting level by finding the 1-dB compression point. This should be approximately -70 dBm. After this test, reconnect the 3.5 MHz oscillator and the SIGNAL IN cable.

(4) COMB SOURCE CHECK

Set the SCAN WIDTH/cm switch S1 to 200 MHz/cm and the R.F. RANGE (GHz) switch S3 to band 2 with the frequency set at 3000 MHz. Connect the comb output to the AILTECH 707 R.F. INPUT jack. Using a clip lead, connect the -18V on the LCVCO assembly (230543) (Figure 4-36) to the -18 V on the comb source. Check the waveform for linearity and ensure that no comb lines are lower than the 70-dB graticule line. After checking for the above, reconnect the cables that were removed and remove the clip lead from the -18 V on the LCVCO assembly and the comb source.

(5) LOOP GAIN CHECK

With the 3.5 MHz oscillator and limiting IF amplifier operating properly, connect a Tektronix 502 oscilloscope using the differential dc input across the 10 ohms sampling resistor R44 located on the J18 YIG driver board (230547) (Figure 4-33). Set R36 on the J18 YIG driver board fully counterclockwise. Set R32 on the J18 YIG driver board fully counterclockwise. Put a 3-GHz S-band signal into the R.F. INPUT jack of the AILTECH 707. Move it to the center of the screen at the 1 MHz/cm dispersion and set the SCAN WIDTH/cm switch to 300 kHz/cm (the phase lock position). Adjust R32 in a clockwise direction while moving the signal on the CRT display from left to right by using the SIGNAL CENTER control so that the voltage displacement on either side of 0 is slightly greater than 50 mV as seen on the Tektronix 502 oscilloscope. It should now be possible to adjust the SIGNAL CENTER control to skip the displayed signal from line to line on either side of center without depressing the SIGNAL CENTER control. Now adjust R36 slowly in a clockwise direction until the signal cannot be moved when the SIGNAL CENTER control is turned to either

extreme in the undepressed mode. The dc loop voltage as measured across the sampling resistor should not exceed 30 mV when the SIGNAL CENTER control is moved to either extreme in the undepressed mode. At this point, it should be possible to move the displayed signal only when the SIGNAL CENTER control is depressed; the displayed signal should not move when the SIGNAL CENTER control is undepressed. At final setting, the measured voltage should be ±30 mV undepressed and ±50 mV when depressed.

3-14. ADDITIONAL CHECKS

a. If the graticule light is not operating, check for the presence of +24 V at the light sockets. If the +24 V is present, replace the bulb.

b. Check the full range operation as follows. With the FULL RANGE switch set to ON, verify the operation of the full range marker. If it is not present, or a large dc offset is present, check U1, U2, and U3 and the associated circuitry on the J1 sweep generator board (230216) (Figure 4-16).

c. If the unit is not working properly in the 1 and 3 MHz/cm position of the SCAN WIDTH/cm switch, check Z1 on S3. Check the J18 YIG driver board (230547) (Figure 4-33) for the appropriate waveforms at test points ① ② and ③.

3-15. DRAWINGS

Block diagrams, wiring diagrams, and connector pin location diagrams are provided here as an aid to troubleshooting and isolation of faulty components. It should be noted that schematic diagrams and parts location illustrations and parts lists are found in Chapter 4 of this manual. The drawings provided here are listed below.

Figure 3-11. AILTECH 707 Spectrum Analyzer Detailed Block Diagram
Figure 3-12. AILTECH 707 Spectrum Analyzer Wiring Diagram
Figure 3-13. Display Unit Wiring Diagram
Figure 3-14. SCAN WIDTH/cm Switch S1 Wiring Diagram
Figure 3-15. SCAN TIME/cm Switch S2 Wiring Diagram
Figure 3-16. R. F. RANGE (GHz) Switch S3 Wiring Diagram
Figure 3-17. BANDWIDTHS (kHz) Switch S4 Wiring Diagram
Figure 3-18. AMPLITUDE RANGE Switch S5 Wiring Diagram
Figure 3-19. SCAN MODE Switch S6 Wiring Diagram
Figure 3-20. Tuner Assembly Wiring Diagram
Figure 3-21. PC Board Connector Pin Locations

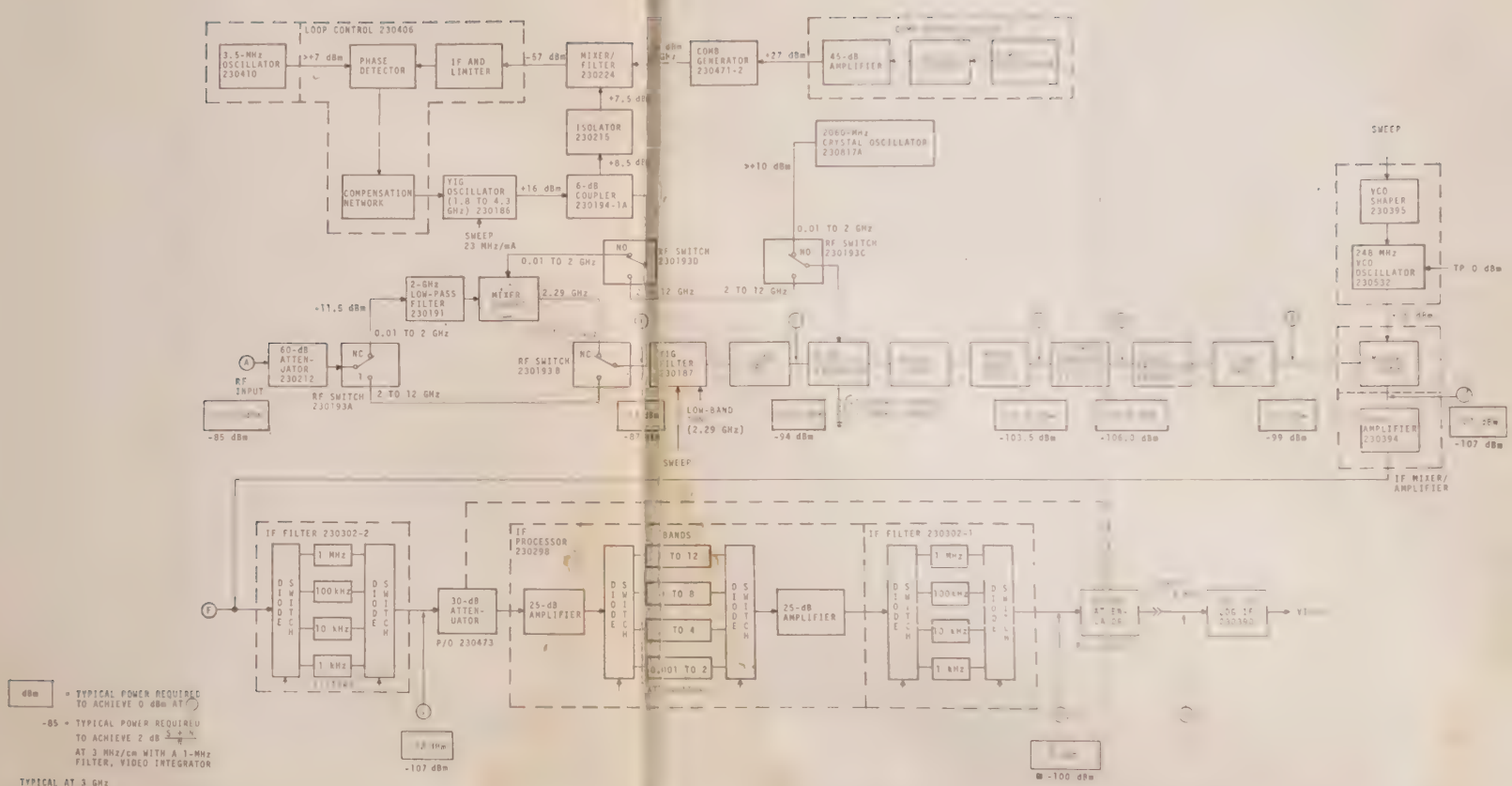


FIGURE 3-11. AILTECH 707 SPECTRUM ANALYZER DETAILED BLOCK DIAGRAM

FIGURE 3-11
SHEET 1 OF 3

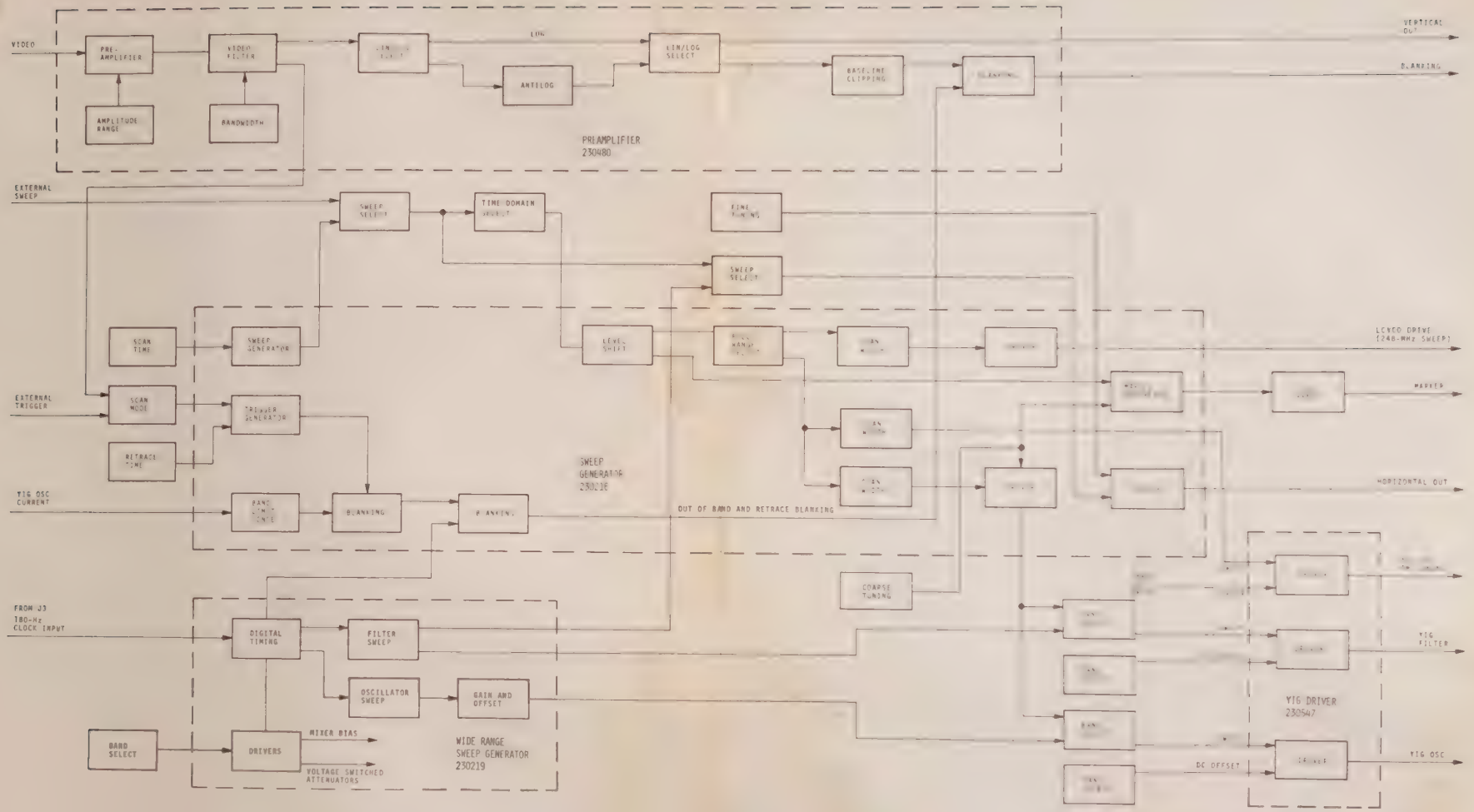


FIGURE 3-11. AILTECH 707 SPECTRUM ANALYZER DETAILED BLOCK DIAGRAM

FIGURE 3-11
SHEET 2 OF 3

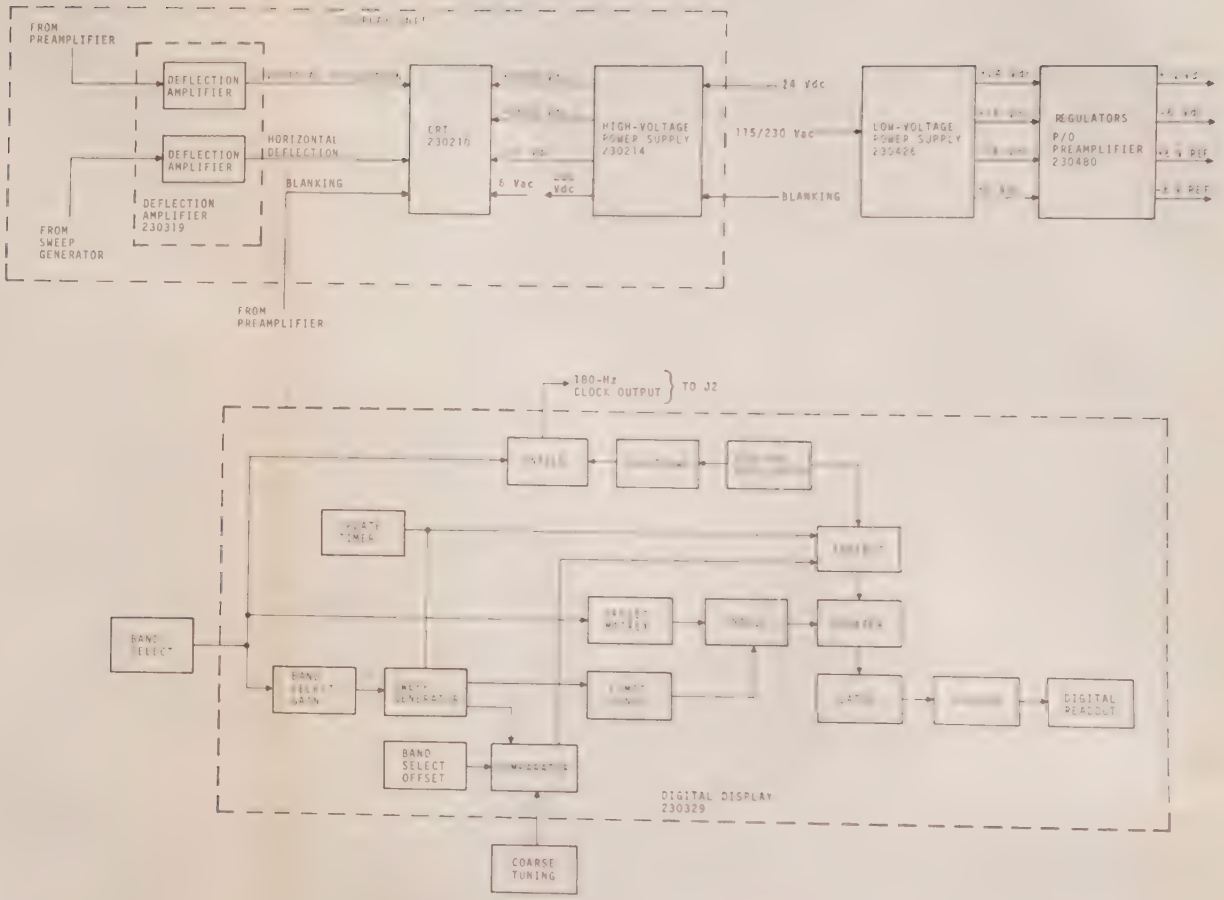


FIGURE 3-11. AILTECH 707 SPECTRUM ANALYZER DETAILED BLOCK DIAGRAM

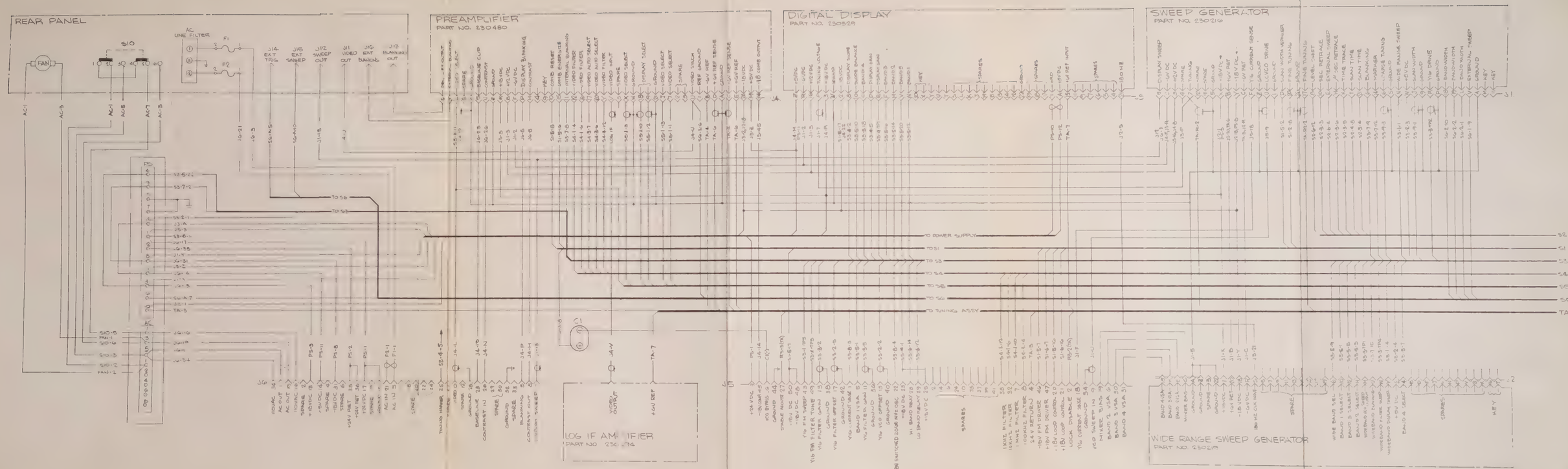


FIGURE 3-12. AILTECH 707 SPECTRUM ANALYZER WIRING DIAGRAM

FIGURE 3-12. AILTECH 707 SPECTRUM ANALYZER WIRING DIAGRAM

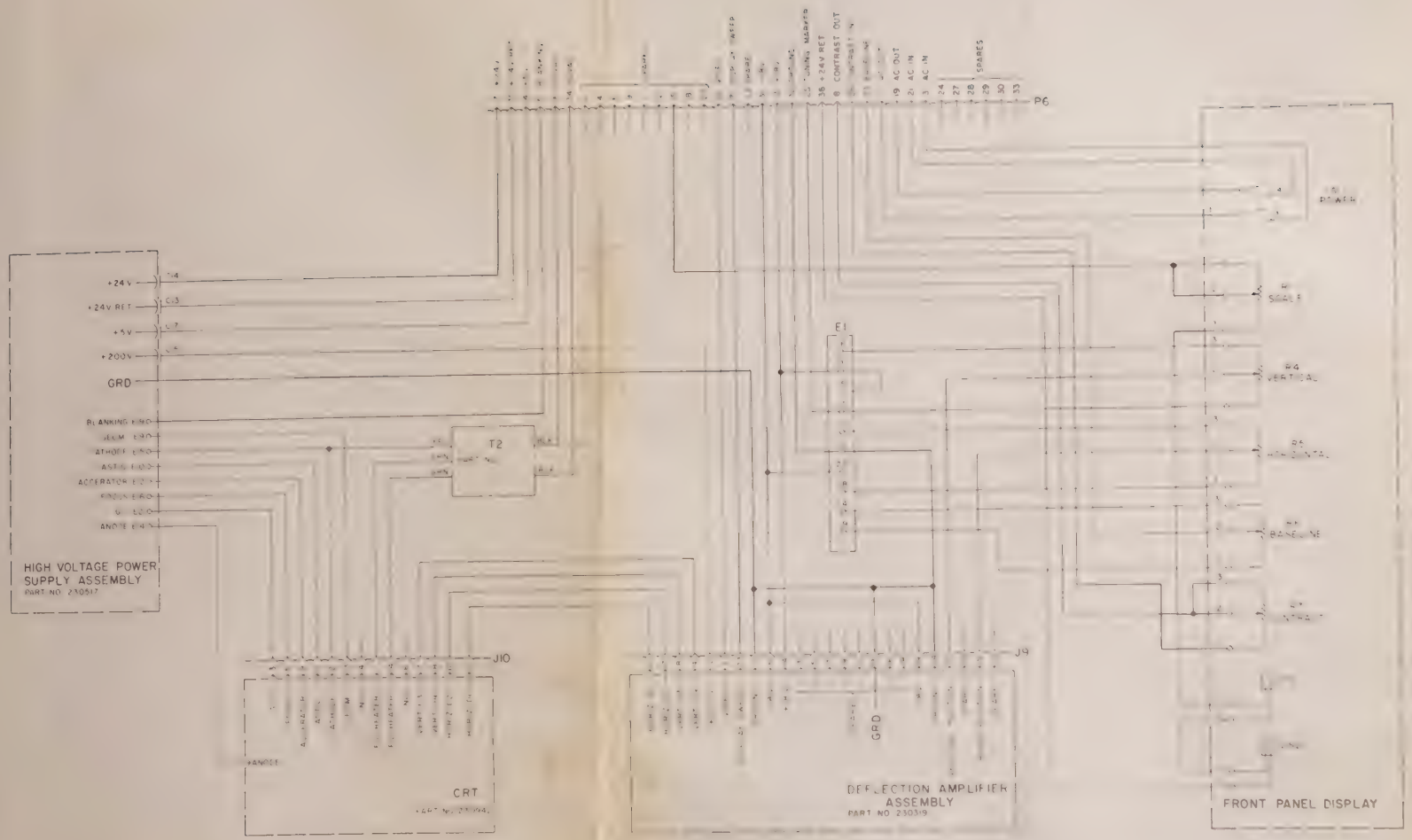


FIGURE 3-13. DISPLAY UNIT WIRING DIAGRAM

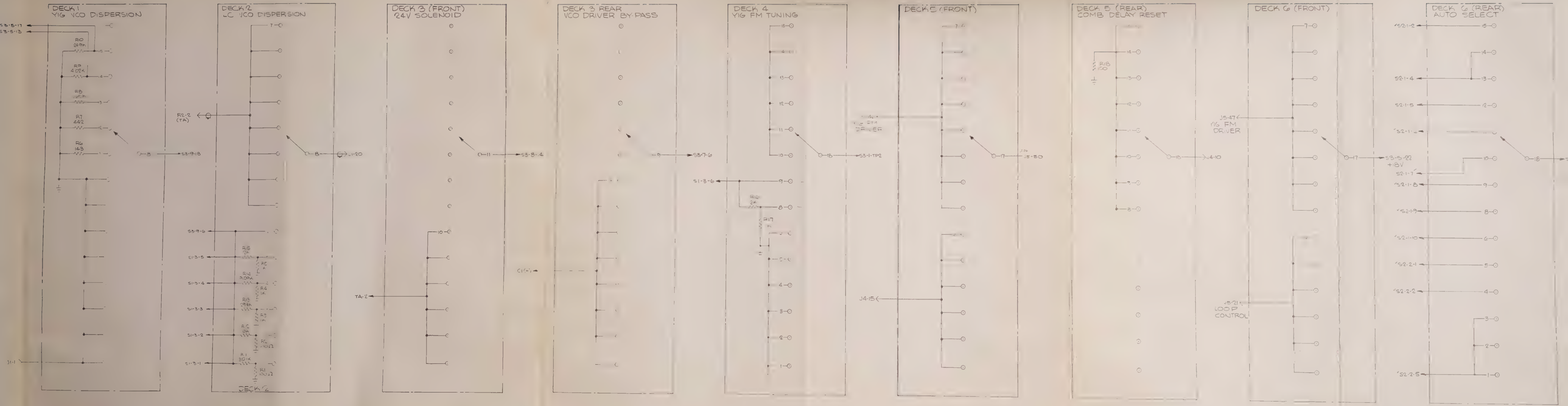
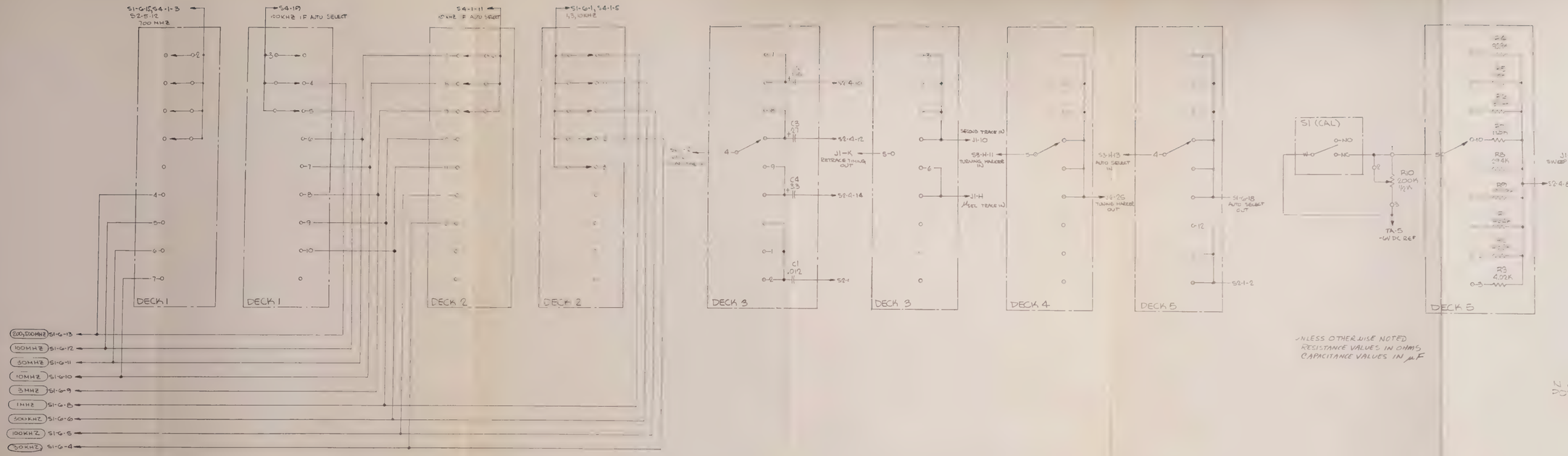


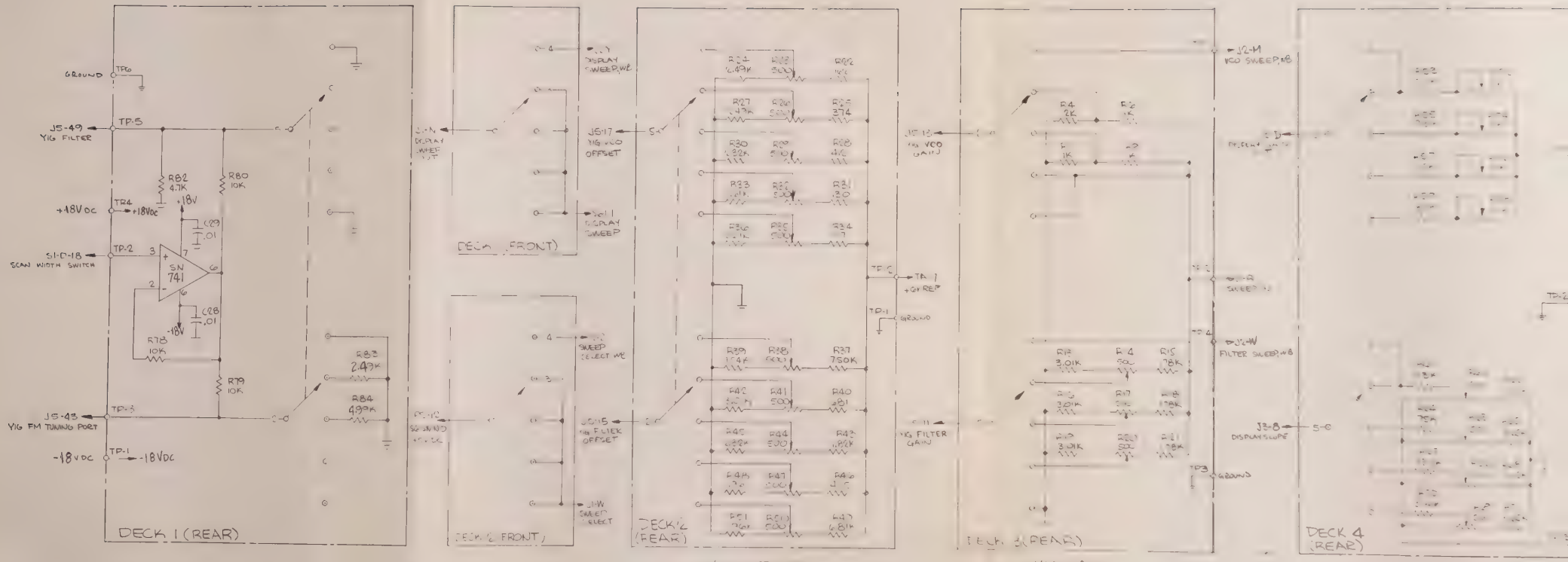
FIGURE 3-14. SCAN WIDTH/cm SWITCH S1 WIRING DIAGRAM

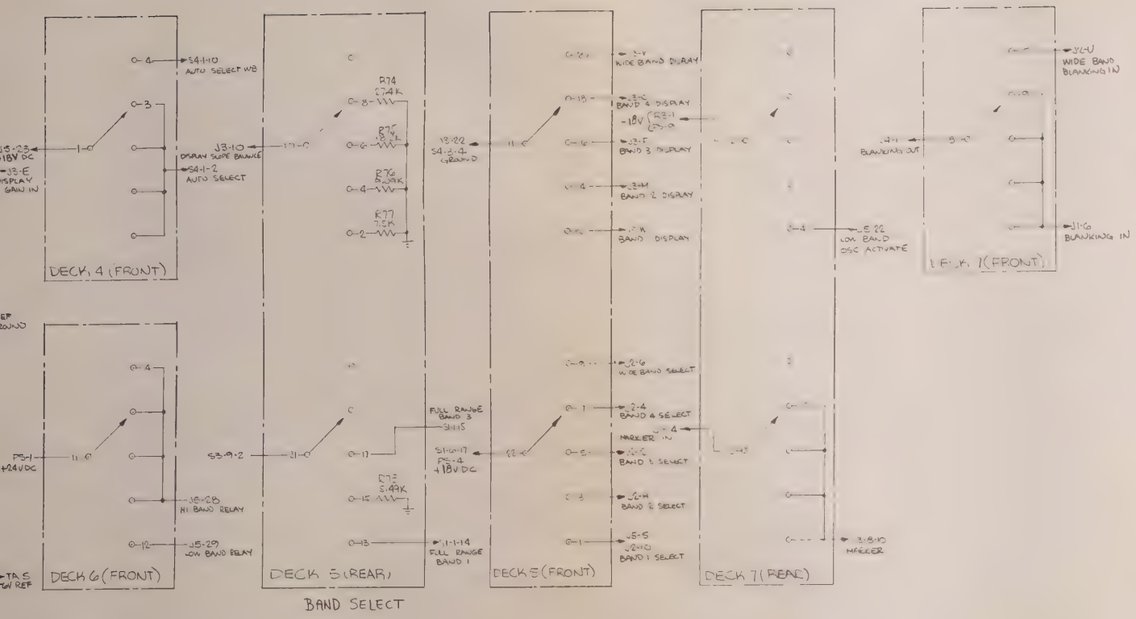


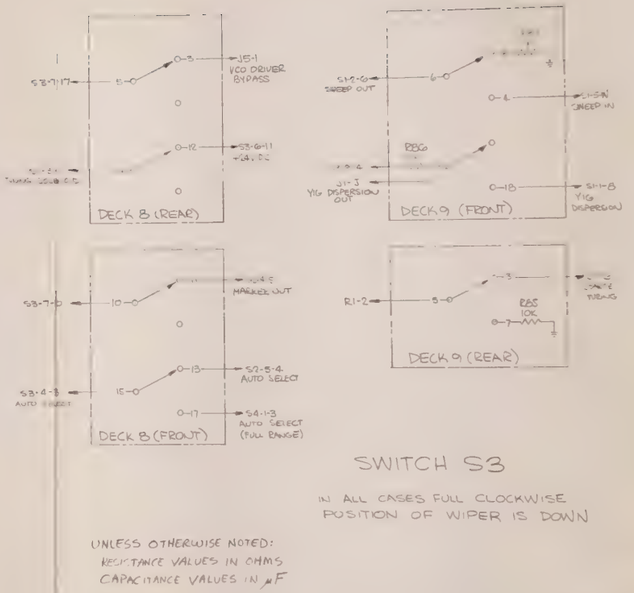
UNLESS OTHERWISE NOTED
RESISTANCE VALUES IN OHMS
CAPACITANCE VALUES IN μF

SWITCH S2
IN ALL CASES, FULL CLOCKWISE
POSITION OF NIPER IS DOWN

FIGURE 3-15. SCAN TIME/cm SWITCH S2 WIRING DIAGRAM


GROUND
TP-6
J5-49
YIG FILTER
TP-5
+18VDC
TP-4
+18VDC
+18V
R82
4.7K
R80
10K
C29
.01
S1-D-18
SCAN WIDTH SWITCH
TP-2
SN
741
C28
.01
-18V
R78
10K
R79
10K
R83
2.49K
R84
4.99K
J5-48
YIG FM TUNING PORT
TP-3
-18VDC
TP-1
-18VDC
DECK 1 (REAR)
DISPLAY SWEEP, WB
J5-17
YIG VCO OFFSET
DISPLAY SWEEP
DECK 2 (FRONT)
SWEEP SELECT WB
J5-15
YIG FILTER OFFSET
J3-W
SWEEP SELECT
DECK 3 (FRONT)
R24 6.49K
R25 374
R27 6.49K
R30 6.49K
R28 4K
R33 6.49K
R31 30
R34 7
R39 174K
R37 750K
R40 681
R41 500
R42 1.62K
R43 2K
R44 500
R46 2K
R47 500
R51 2.61K
R50 500
R49 6.81K
TP-6
TP-1
GROUND
DECK 2 (REAR)
J5-12
YIG VCO GAIN
J5-11
YIG FILTER GAIN
DECK 3 (REAR)
J2-M
VCO SWEEP, WB
TP-2
TP-4
J2-W
FILTER SWEEP, WB
J3-8
DISPLAY SWEEP
TP-3
GROUND
DECK 4 (REAR)
YIG OFFSETS
YIG GAINS
DIGITAL DISPLAY





SWITCH S3

IN ALL CASES FULL CLOCKWISE POSITION OF WIPER IS DOWN

UNLESS OTHERWISE NOTED:
RESISTANCE VALUES IN OHMS
CAPACITANCE VALUES IN μF

FIGURE 3-16. R. F. RANGE (GHz) SWITCH S3 WIRING DIAGRAM

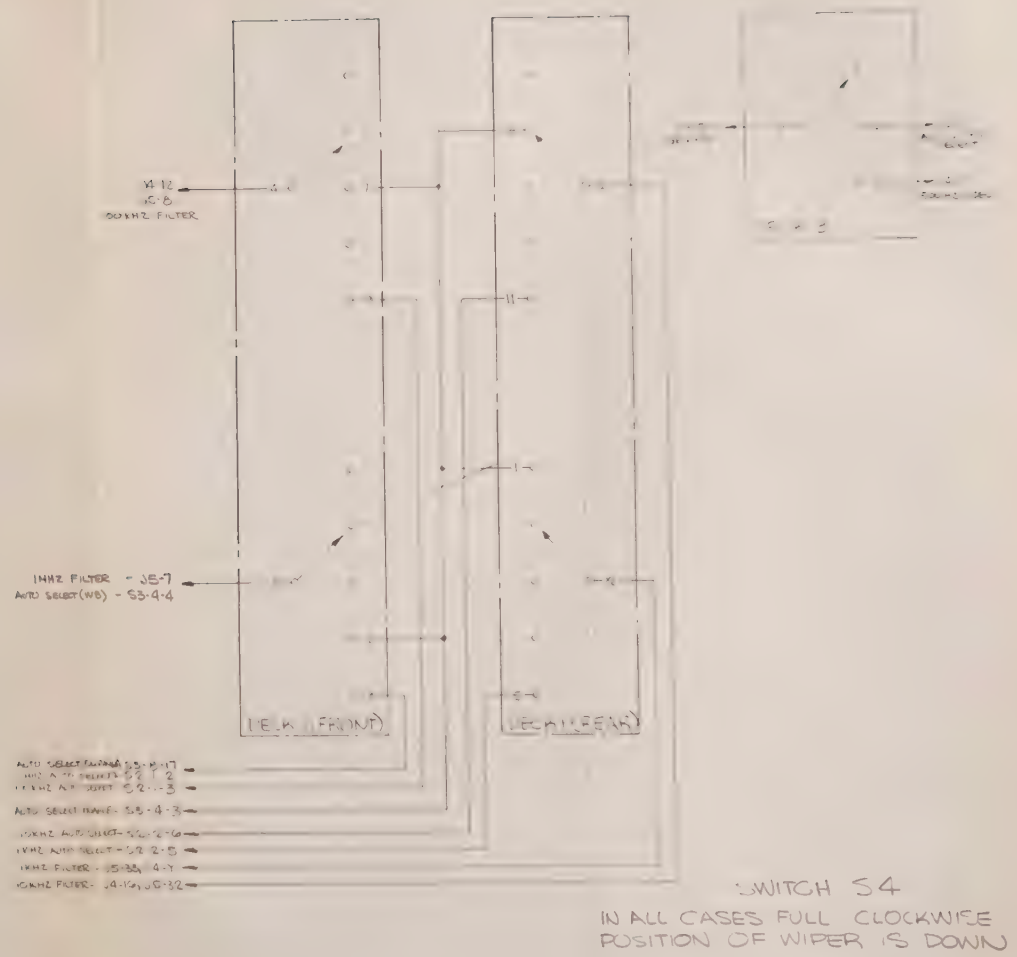


FIGURE 3-17. BANDWIDTHS (kHz) SWITCH S4 WIRING DIAGRAM

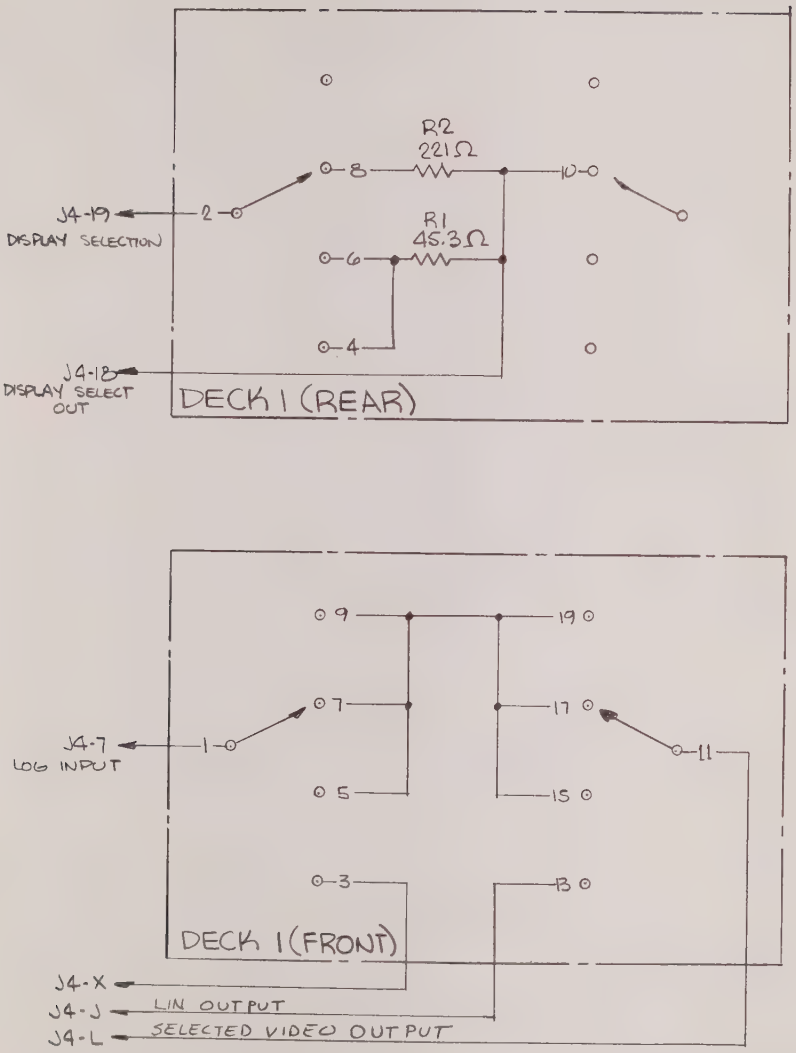


FIGURE 3-18. AMPLITUDE RANGE SWITCH S5 WIRING DIAGRAM

FIGURE 3-19. SCAN MODE SWITCH S6 WIRING DIAGRAM

FIGURE 3-19

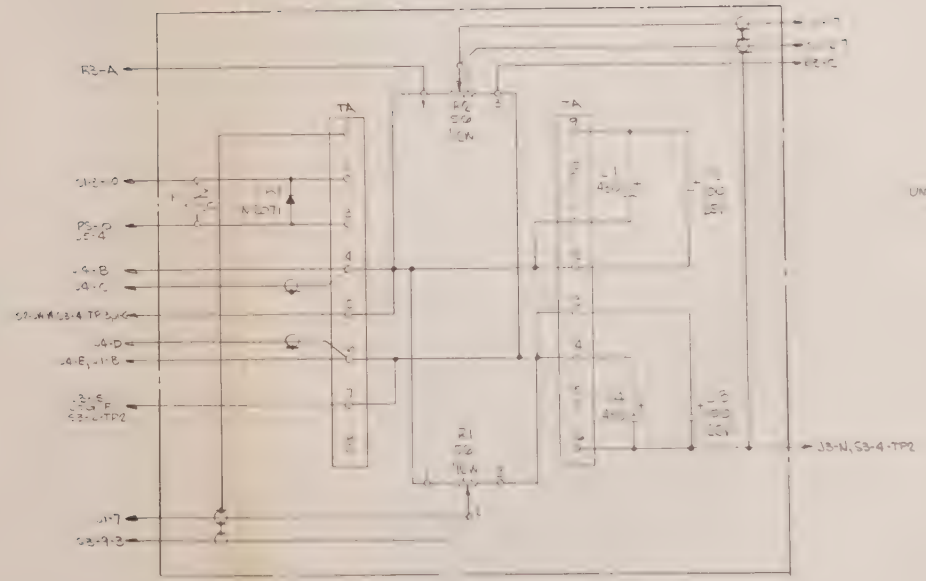


FIGURE 3-20. TUNER ASSEMBLY WIRING DIAGRAM

FIGURE 3-20

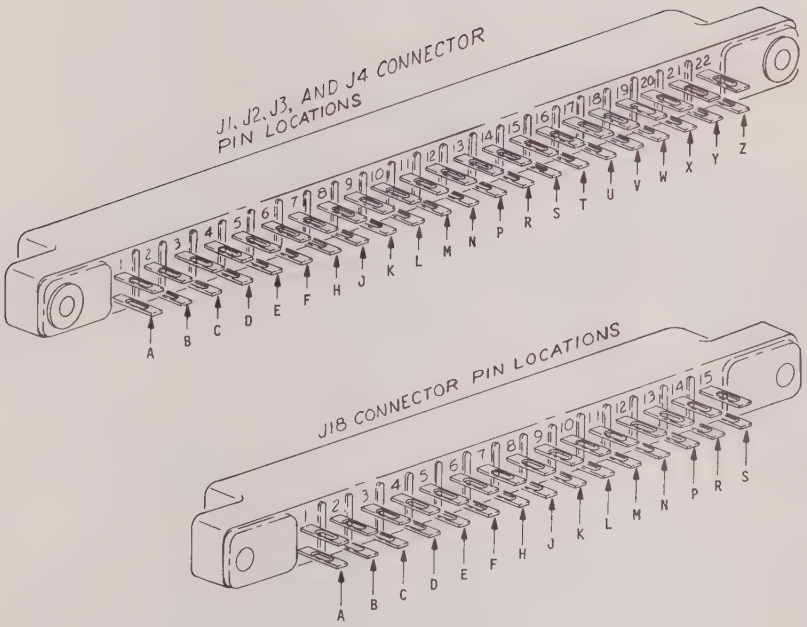

J1, J2, J3, AND J4 CONNECTOR
PIN LOCATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
A B C D E F H J K L M N P R S T U V W X Y Z
J18 CONNECTOR PIN LOCATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F H J K L M N P R S

FIGURE 3-21. PC BOARD CONNECTOR PIN LOCATIONS

CHAPTER 4
PARTS LOCATION

SECTION I. GENERAL

This chapter presents information for parts location, schematic diagrams, and lists of replaceable components of the AILTECH 707 Spectrum Analyzer (Figure 4-1).

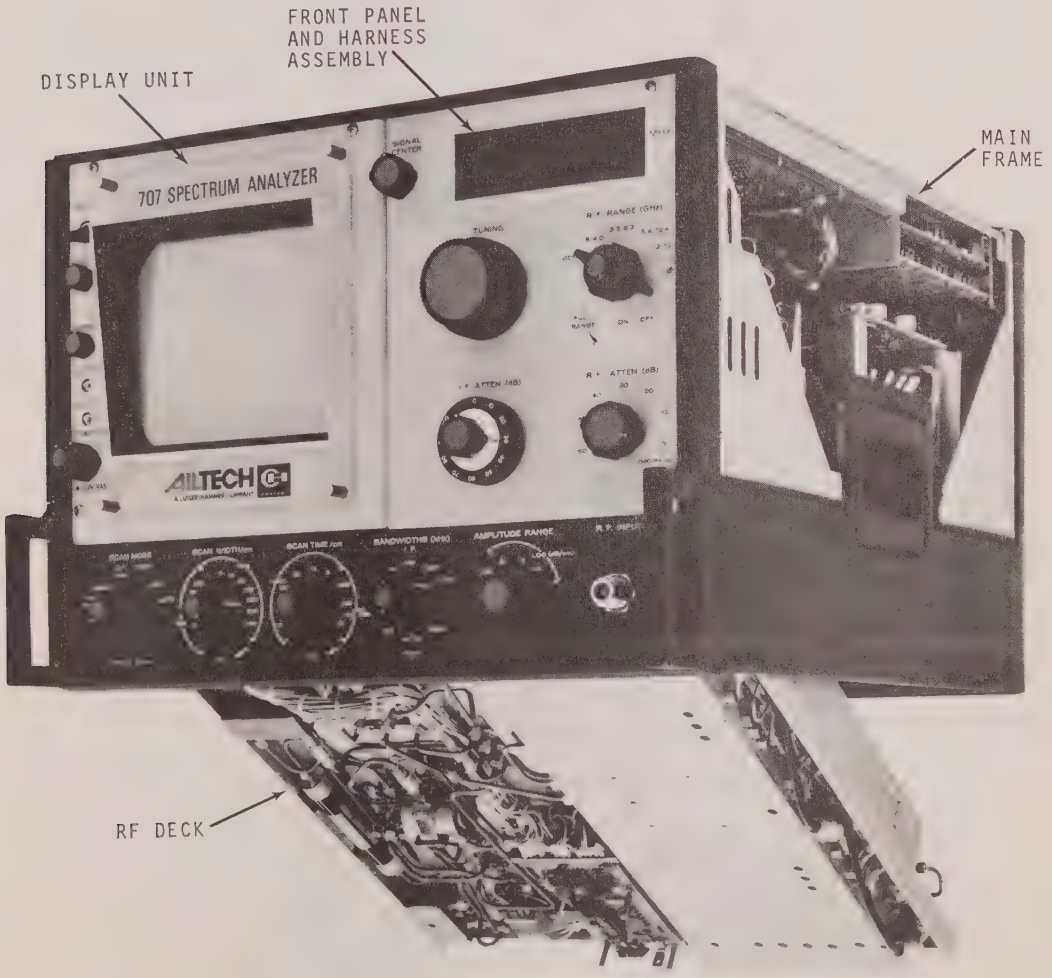


FIGURE 4-1. AILTECH 707 SPECTRUM ANALYZER COMPONENT PARTS

SECTION II. FRONT PANEL AND HARNESS ASSEMBLY

This section provides information for parts location and lists of replaceable parts for the subassemblies of front panel and harness assembly (Figure 4-2).

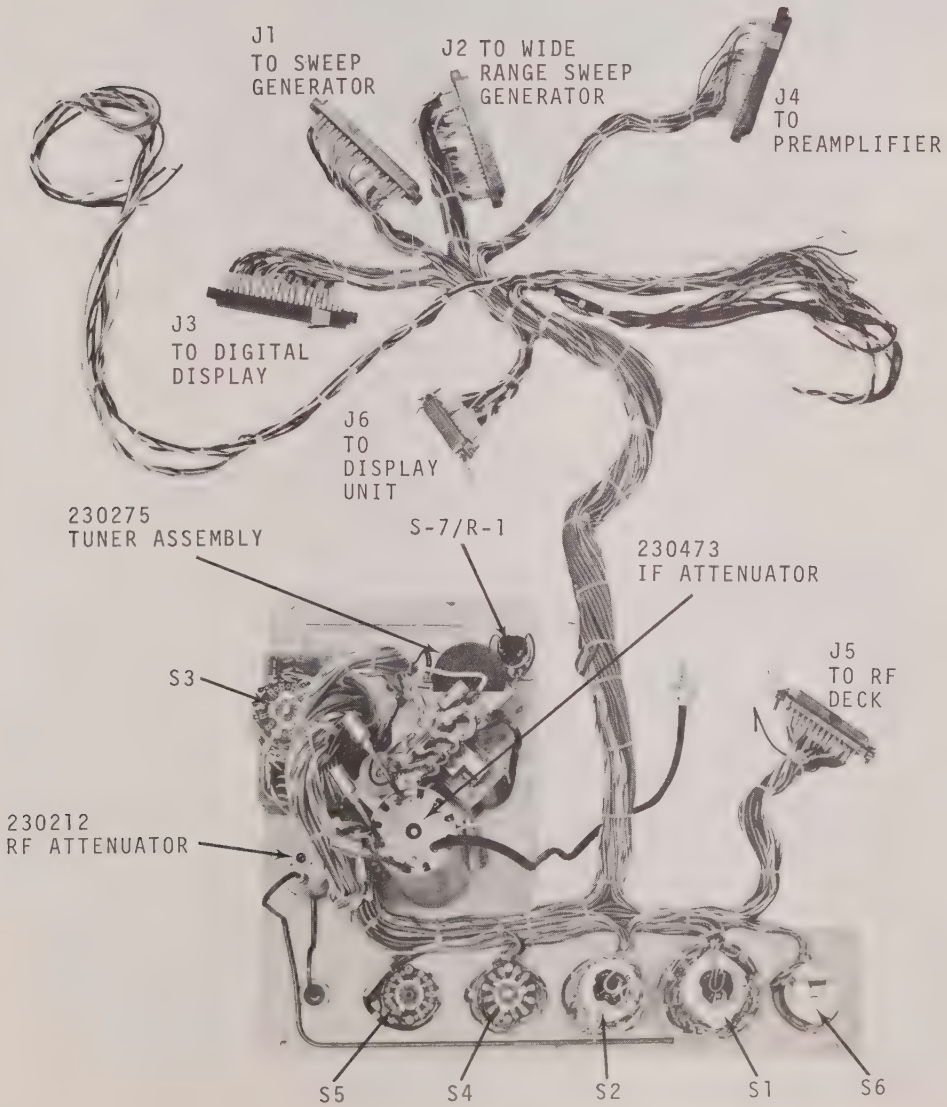


FIGURE 4-2. FRONT PANEL AND HARNESS ASSEMBLY

SCAN WIDTH/cm SWITCH S1 (230182)

Item	Description	Manufacturer	Part No.
R1	Resistor, 100, 1/8 W		RN60C1000F
R2	Resistor, 100, 1/8 W		RN60C1000F
R3	Resistor, 1 k, 1/8 W		RN60C1001F
R4	Resistor, 1 k, 1/8 W		RN60C1001F
R5	Resistor, 1 k, 1/8 W		RN60C1001F
R6	Resistor, 143, 1/8 W		RN60C1430F
R7	Resistor, 442, 1/8 W		RN60C4420F
R8	Resistor, 1.65 k, 1/8 W		RN60C1651F
R9	Resistor, 4.02 k, 1/8 W		RN60C4021F
R10	Resistor, 24.9 k, 1/8 W		RN60C2492F
R11	Resistor, 30.1 k, 1/8 W		RN60C3012F
R12	Resistor, 10 k, 1/8 W		RN60C1002F
R13	Resistor, 29.4 k, 1/8 W		RN60C2942F
R14	Resistor, 9.09 k, 1/8 W		RN60C9091F
R15	Resistor, 2 k, 1/8 W		RN60C2001F
R16	Resistor, 2 k, 1/8 W		RN60C2001F
R17	Resistor, 1 k, 1/8 W		RN60C1001F
R18	Resistor, 100, 1/4 W		RC07GF101J
R19	Resistor, 1 k, 1/4 W		RC07GF102J
R20/S1	Resistor, variable, 10 k, 3 A, 125 V	CTS	WR5305

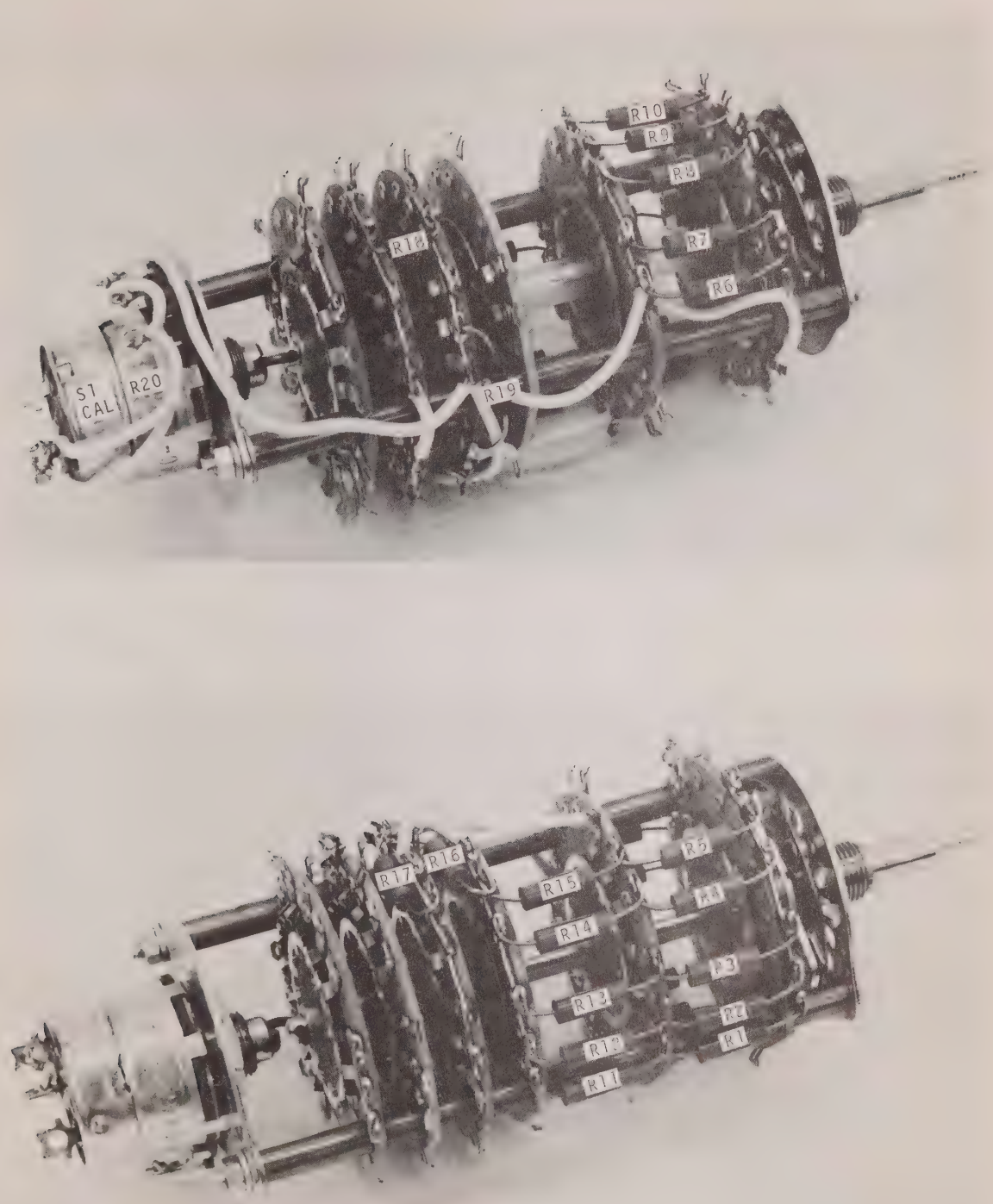


FIGURE 4-3. SCAN WIDTH/cm SWITCH S1 (230182)

SCAN TIME/cm SWITCH S2 (230183)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 0.01 μF	Sprague	5HKS-S10
C2	Capacitor, 100 μF	Sprague	CS13BC107K
C3	Capacitor, 27 μF	Sprague	CS13BC276K
C4	Capacitor, 3.3 μF	Sprague	CS13BD335K
R1	Resistor, 464 k, 1/8 W		RN60C4643F
R2	Resistor, 43.2 k, 1/8 W		RN60C4322F
R3	Resistor, 4.02 k, 1/8 W		RN60C4021F
R4	Resistor, 90.9 k, 1/8 W		RN60C9092F
R5	Resistor, 28 k, 1/8 W		RN60C2802F
R6	Resistor, 37.4 k, 1/8 W		RN60C3742F
R7	Resistor, 11.3 k, 1/8 W		RN60C1132F
R8	Resistor, 29.4 k, 1/8 W		RN60C2942F
R9	Resistor, 9.09 k, 1/8 W		RN60C9091F
R10/S1	Resistor, variable, 20 k, 3 A, 125 V	CTS	WR5314

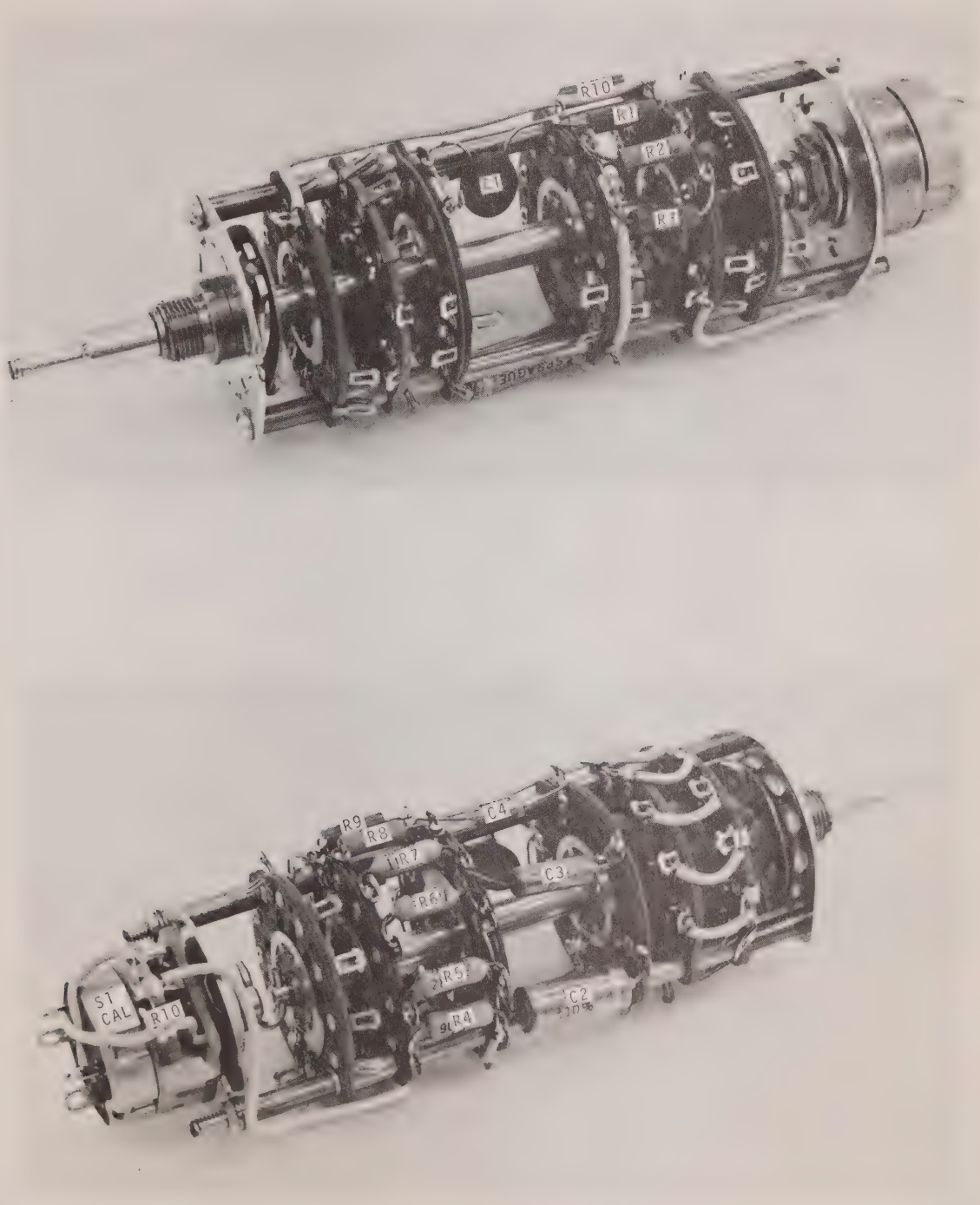


FIGURE 4-4. SCAN TIME/cm SWITCH S2 (230183)

R. F. RANGE (GHz) SWITCH S3 (230334)

Item	Description	Manufacturer	Part No.
R73	Resistor, 5.49 k, 1%, 1/8 W		RN60C5491F
R74	Resistor, 27.4 k, 1%, 1/8 W		RN60C2742F
R75	Resistor, 18.2 k, 1%, 1/8 W		RN60C1822F
R76	Resistor, 9.09 k, 1%, 1/8 W		RN60C9091F
R77	Resistor, 7.5 k, 1%, 1/8 W		RN60C7501F
R85	Resistor, 10 k, 1%, 1/8 W		RN60C1002F
R86	Resistor, 10 k, 1%, 1/8 W		RN60C1002F
R87	Resistor, 1 k, 1/4 W		RC07GF102J
	YIG FM Tuning Drive Board Deck 1	AILTECH	230561
	YIG Offset Board Deck 2	AILTECH	230339
	YIG Gains Board Deck 3	AILTECH	230337
	Digital Display Board Deck 4	AILTECH	230335

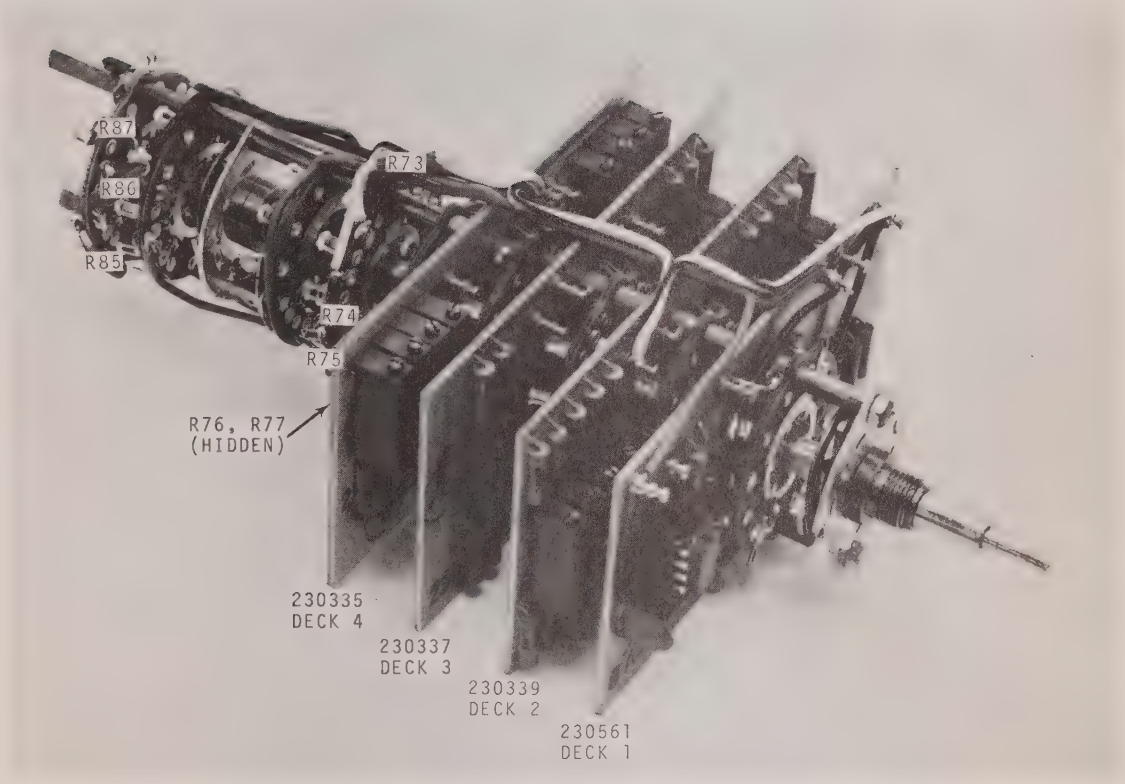


FIGURE 4-5. R.F. RANGE (GHz) SWITCH S3 (230334)

SWITCH S3 DECK 1--YIG FM TUNING DRIVE BOARD (230561)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 0.01 μF	Sprague	5HKS-S10
C2	Capacitor, 0.01 μF	Sprague	5HKS-S10
R78	Resistor, 10 k, 1/8 W		RN60C1002F
R79	Resistor, 10 k, 1/4 W		RC07GF103J
R80	Resistor, 10 k, 1/4 W		RC07GF103J
R81	Not used		
R82	Resistor, 4.7 k, 1/4 W		RC07GF472J
R83	Resistor, 4.99 k, 1/8 W		RN60C4991J
R84	Resistor, 2.49 k, 1/8 W		RN60C2491F
Z1	IC	TI	SN72741P

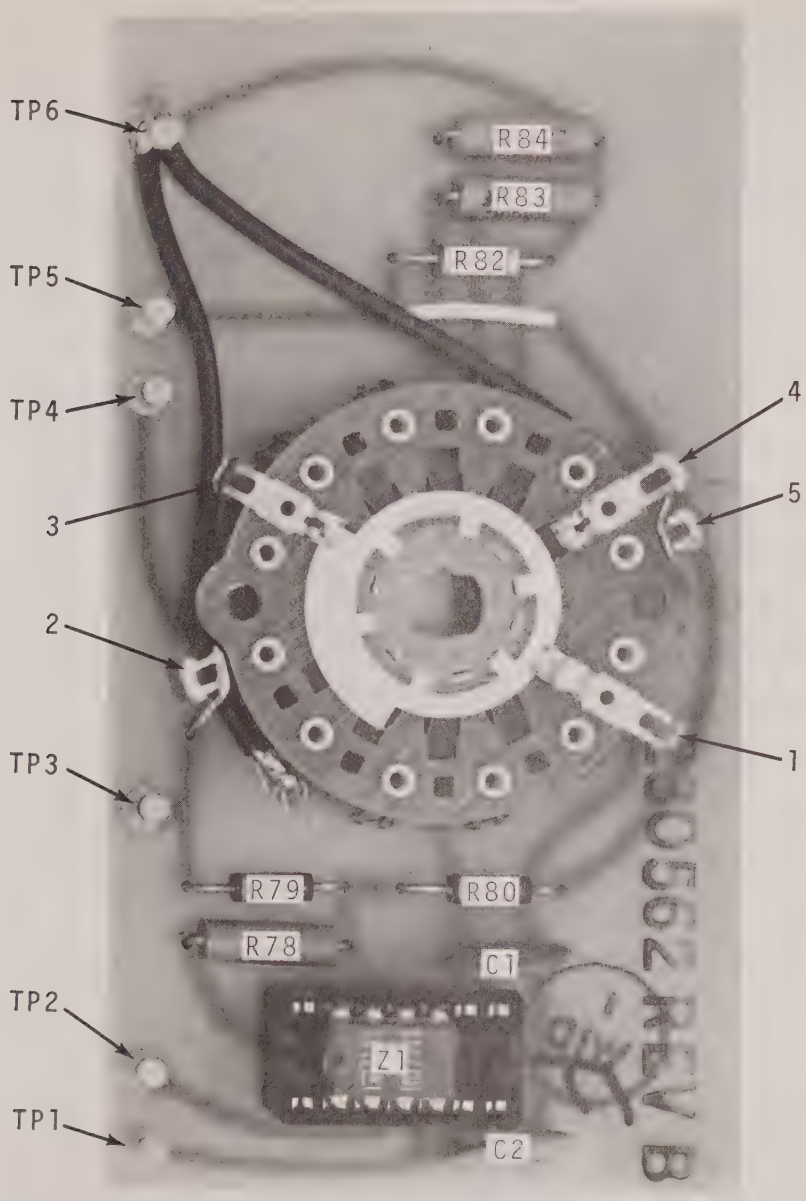


FIGURE 4-6. SWITCH S3 DECK 1--YIG FM TUNING DRIVE BOARD (230561)

SWITCH S3 DECK 2--YIG OFFSET BOARD (230339)

Item	Description	Manufacturer	Part No.
R22	Resistor, 162, 1%, 1/8 W		RN60C1620F
R23	Resistor, variable, 500	Bourns	3009P-1-501
R24	Resistor, 2.49 k, 1%, 1/8 W		RN60C2491F
R25	Resistor, 374, 1%, 1.8 W		RN60C3740F
R26	Resistor, variable, 500	Bourns	3009P-1-501
R27	Resistor, 2.49 k, 1%, 1/8 W		RN60C2491F
R28	Resistor, 412, 1%, 1/8 W		RN60C4120F
R29	Resistor, variable, 500	Bourns	3009P-1-501
R30	Resistor, 2.32 k, 1%, 1/8 W		RN60C2321F
R31	Resistor, 130, 1%, 1/8 W		RN60C1300F
R32	Resistor, variable, 500	Bourns	3009P-1-501
R33	Resistor, 2.61 k, 1%, 1/8 W		RN60C2611F
R34	Resistor, 107, 1%, 1/8 W		RN60C1070F
R35	Resistor, variable, 500	Bourns	3009P-1-501
R36	Resistor, 2.61 k, 1%, 1/8 W		RN60C2611F
R37	Resistor, 7.50 k, 1%, 1/8 W		RN60C7501F
R38	Resistor, variable, 500	Bourns	3009P-1-501
R39	Resistor, 1.54 k, 1%, 1/8 W		RN60C1541F
R40	Resistor, 681, 1%, 1/8 W		RN60C6810F
R41	Resistor, variable, 500	Bourns	3009P-1-501
R42	Resistor, 3.01 k, 1%, 1/8 W		RN60C3011F
R43	Resistor, 1.82 k, 1%, 1/8 W		RN60C1821F
R44	Resistor, variable, 500	Bourns	3009P-1-501
R45	Resistor, 2.32 k, 1%, 1/8 W		RN60C2321F
R46	Resistor, 4.75 k, 1%, 1/8 W		RN60C4751F
R47	Resistor, variable, 500	Bourns	3009P-1-501

SWITCH S3 DECK 2--YIG OFFSET BOARD (230339) (cont)

Item	Description	Manufacturer	Part No.
R48	Resistor, 1.96 k, 1%, 1/8 W		RN60C1961F
R49	Resistor, 6.81 k, 1%, 1/8 W		RN60C6811F
R50	Resistor, variable, 500	Bourns	3009P-1-501
R51	Resistor, 1.96 k, 1%, 1/8 W		RN60C1961F

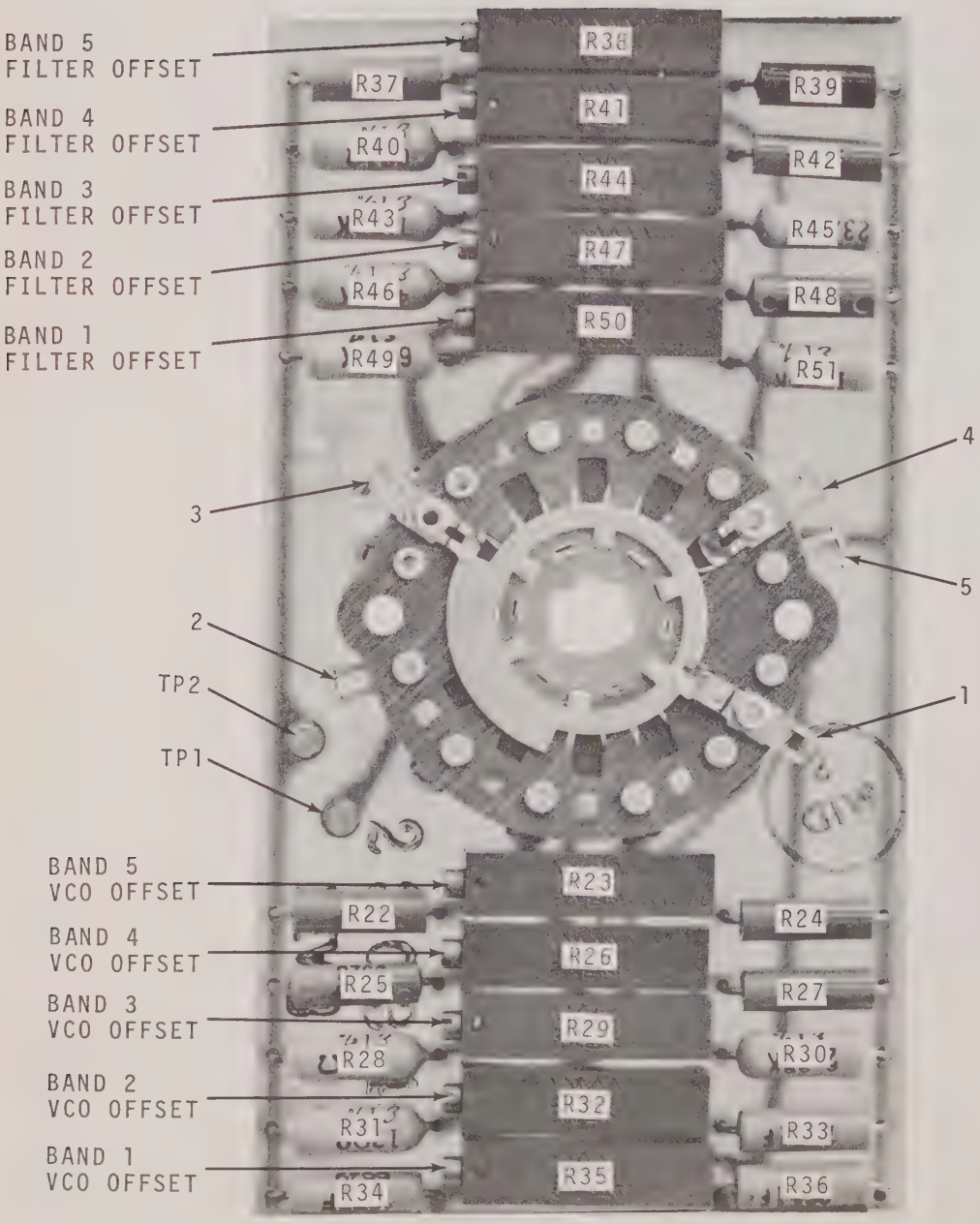


FIGURE 4-7. SWITCH S3 DECK 2--YIG OFFSET BOARD (230339)

SWITCH S3 DECK 3--YIG GAINS BOARD (230337)

Item	Description	Manufacturer	Part No.
R1, R2 R3	Not used		
R4	Resistor, 2 k, 1%, 1/8 W		RN60C2001F
R5	Not used		
R6	Resistor, 1 k, 1%, 1/8 W		RN60C1001F
R7	Resistor, 1 k, 1%, 1/8 W		RN60C1001F
R8	Not used		
R9	Resistor, 1 k, 1%, 1/8 W		RN60C1001F
R10, R11, R12	Not used		
R13	Resistor, 3.01 k, 1%, 1/8 W		RN60C3011F
R14	Resistor, variable, 500	Bourns	3009P-1-501
R15	Resistor, 1.78 k, 1%, 1/8 W		RN60C1781F
R16	Resistor, 3.01 k, 1%, 1/8 W		RN60C3011F
R17	Resistor, variable, 500	Bourns	3009P-1-501
R18	Resistor, 1.78 k, 1%, 1/8 W		RN60C1781F
R19	Resistor, 30.1 k, 1%, 1/8 W		RN60C3011F
R20	Resistor, variable, 500	Bourns	3009P-1-501
R21	Resistor, 1.78 k, 1%, 1/8 W		RN60C1781F

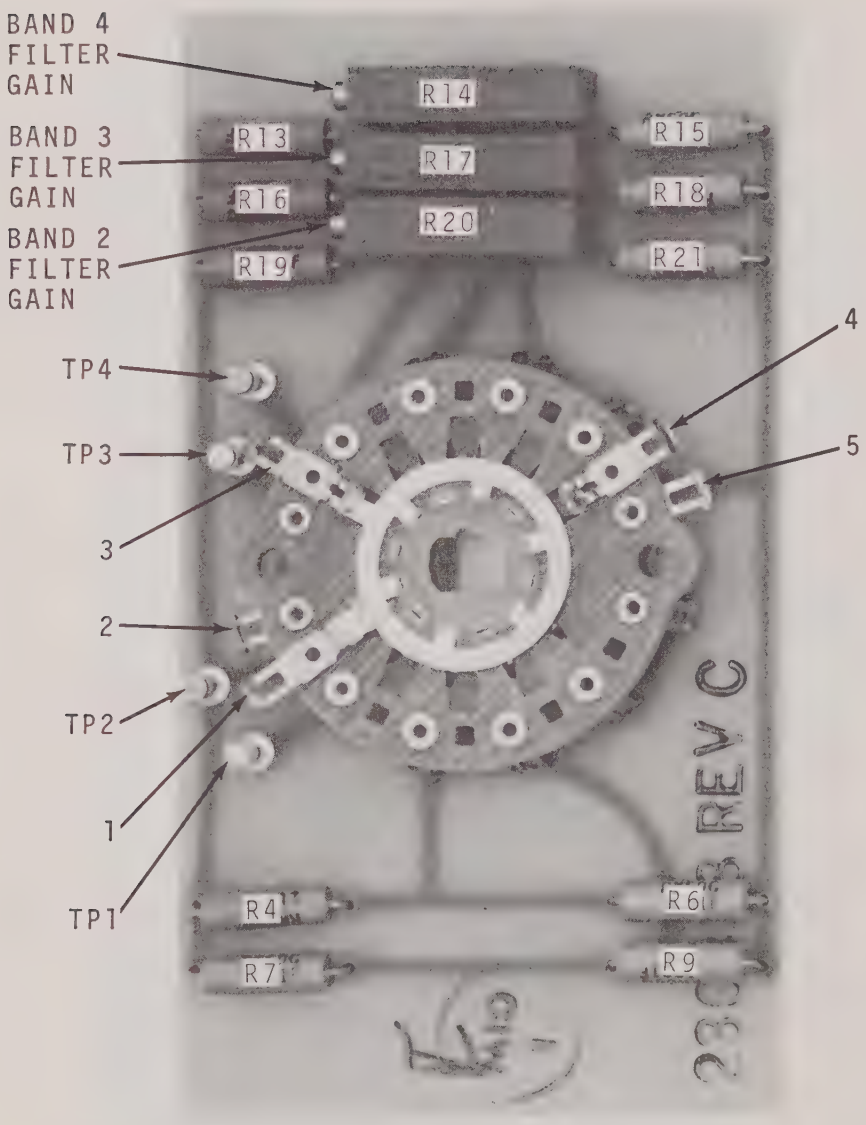


FIGURE 4-8. SWITCH S3 DECK 3--YIG GAINS BOARD (230337)

SWITCH S3 DECK 4--DIGITAL DISPLAY BOARD (230335)

Item	Description	Manufacturer	Part No.
R52	Resistor, variable, 2 k	Bourns	3009P-1-202
R53	Resistor, 5.11 k, 1%, 1/8 W		RN60C5111F
R54	Resistor, variable, 5 k	Bourns	3009P-1-502
R55	Resistor, 9.31 k, 1%, 1/8 W		RN60C9311F
R56	Resistor, variable, 10 k	Bourns	3009P-1-103
R57	Resistor, 7.5 k, 1%, 1/8 W		RN60C7501F
R58	Resistor, variable, 10 k	Bourns	3009P-1-103
R59	Resistor, 18.7 k, 1%, 1/8 W		RN60C1872F
R60	Resistor, variable, 500	Bourns	3009P-1-501
R61	Resistor, 113 k, 1%, 1/8 W		RN60C1133F
R62	Resistor, 3.65 k, 1%, 1/8 W		RN60C3651F
R63	Resistor, variable, 500	Bourns	3009P-1-501
R64	Resistor, 75 k, 1%, 1/8 W		RN60C7502F
R65	Resistor, 3.65 k, 1%, 1/8 W		RN60C3651F
R66	Resistor, variable, 500	Bourns	3009P-1-501
R67	Resistor, 53.6 k, 1%, 1/8 W		RN60C5362F
R68	Resistor, 3.65 k, 1%, 1/8 W		RN60C3651F
R69	Resistor, variable, 500	Bourns	3009P-1-501
R70	Resistor, 31.6 k, 1%, 1/8 W		RN60C3162F
R71	Resistor, 3.65 k, 1%, 1/8 W		RN60C3651F

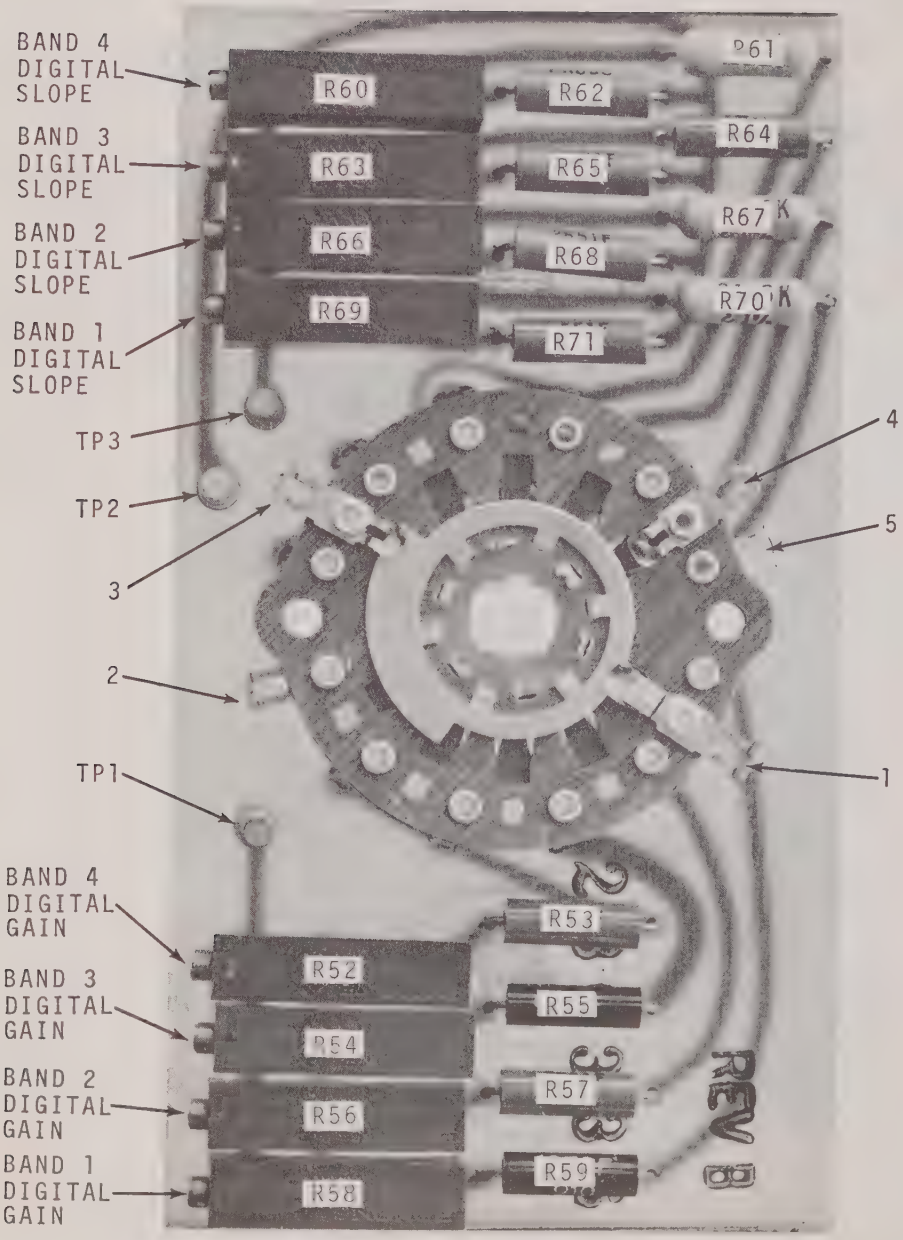


FIGURE 4-9. SWITCH S3 DECK 4--DIGITAL DISPLAY BOARD (230335)

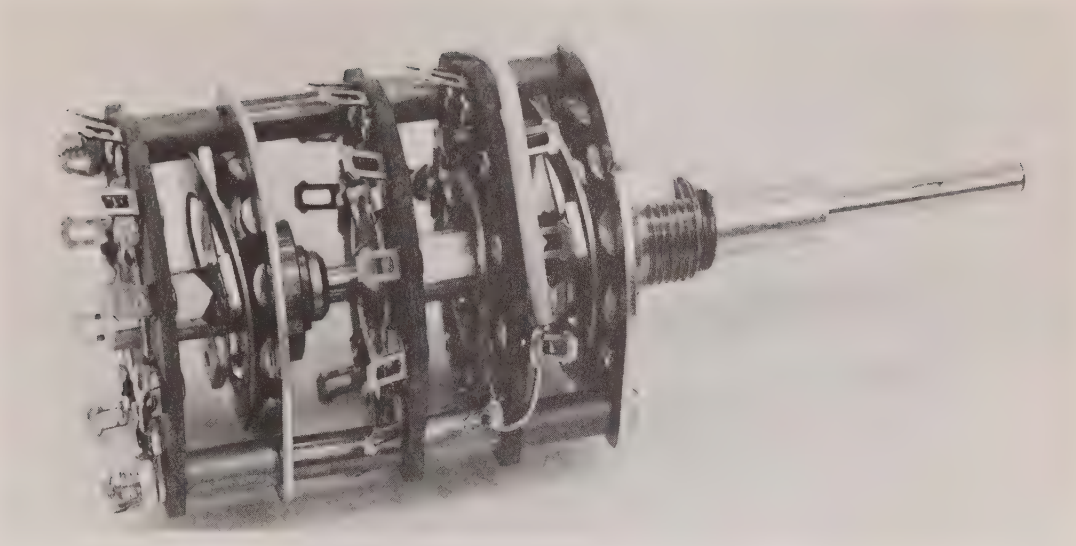


FIGURE 4-10. BANDWIDTHS (kHz) SWITCH S4 (230185)

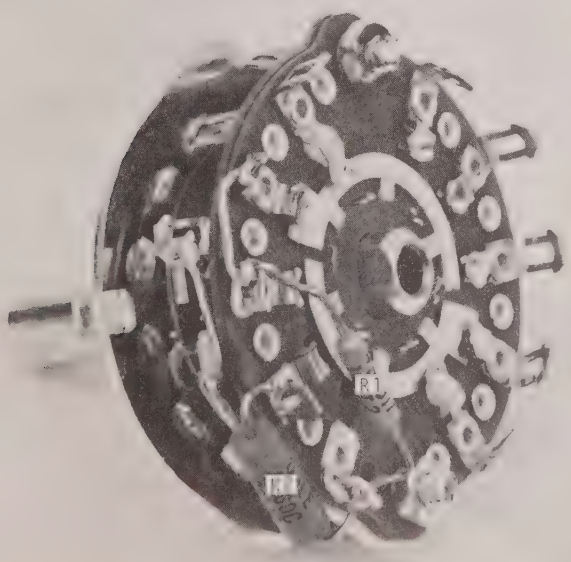


FIGURE 4-11. AMPLITUDE RANGE SWITCH S5 (230453)

Item	Description	Manufacturer	Part No.
R1	Resistor, 45.3, 1/8 W		RN60C45R3
R2	Resistor, 221, 1/8 W		RN60C2210F

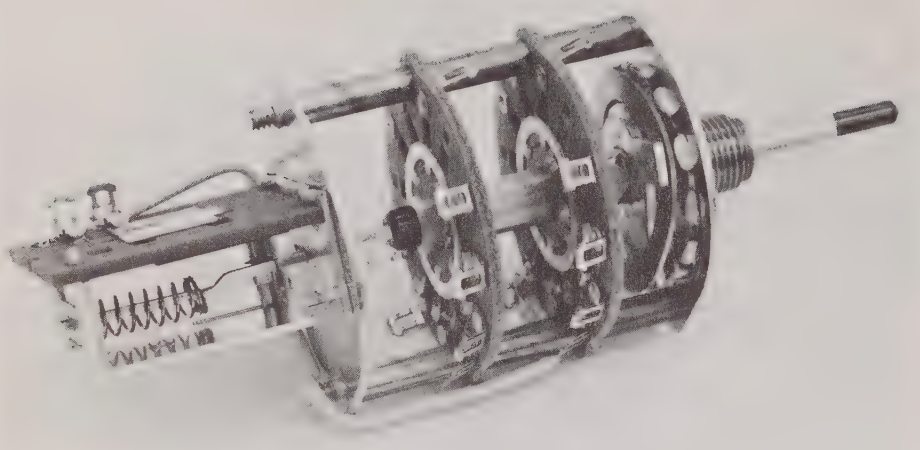


FIGURE 4-12. SCAN MODE SWITCH S6 (230452)

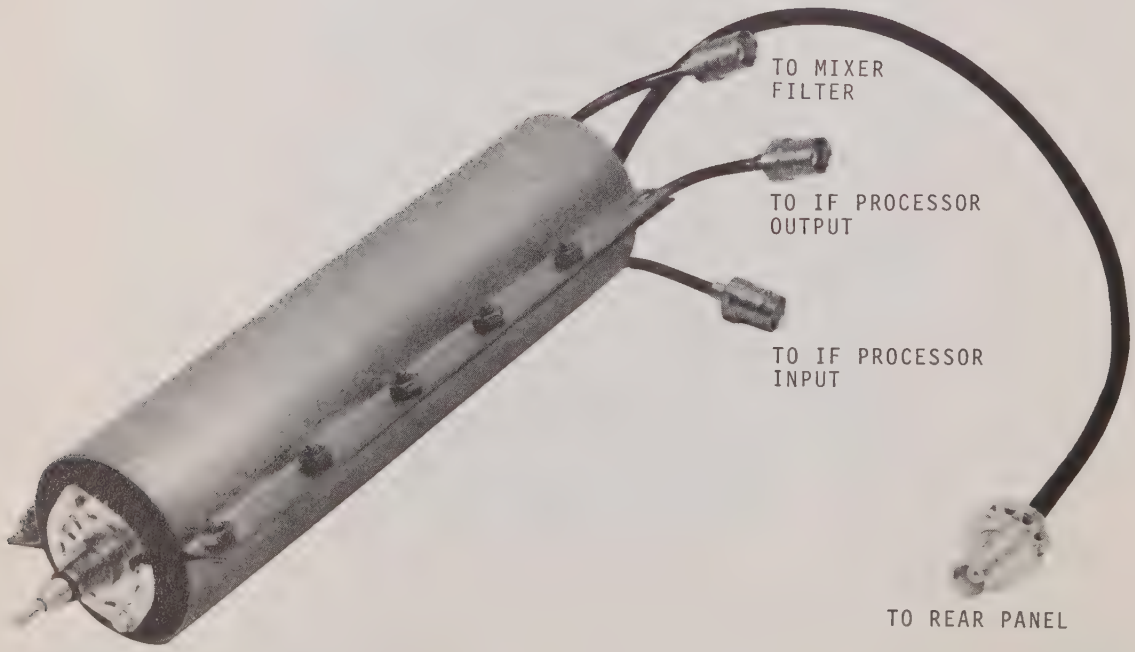


FIGURE 4-13. IF ATTENUATOR (230473)

TUNER ASSEMBLY (230275)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 430 μF	Sprague	109D437X0008T2
C2	Capacitor, 100 μF, 25 V	Sprague	TE-1211
C3	Capacitor, 100 μF, 25 V	Sprague	TE-1211
C4	Capacitor, 430 μF	Sprague	109D437X0008T2
CR1	Diode		1N2071
K1	Solenoid	Guardian	11DC-72-C-24 Vdc
R1	Resistor, variable, 5 k	Bourns	3400S-1-502
R2	Resistor, variable, 5 k	Bourns	3400S-1-502
R3	Not used		
R4	Resistor, 56, 0.5 W		RC20GF560J
R5	Resistor, 56, 0.5 W		RC20GF560J
R6	Resistor, 5.1 k, 1/4 W		RC07GF512J

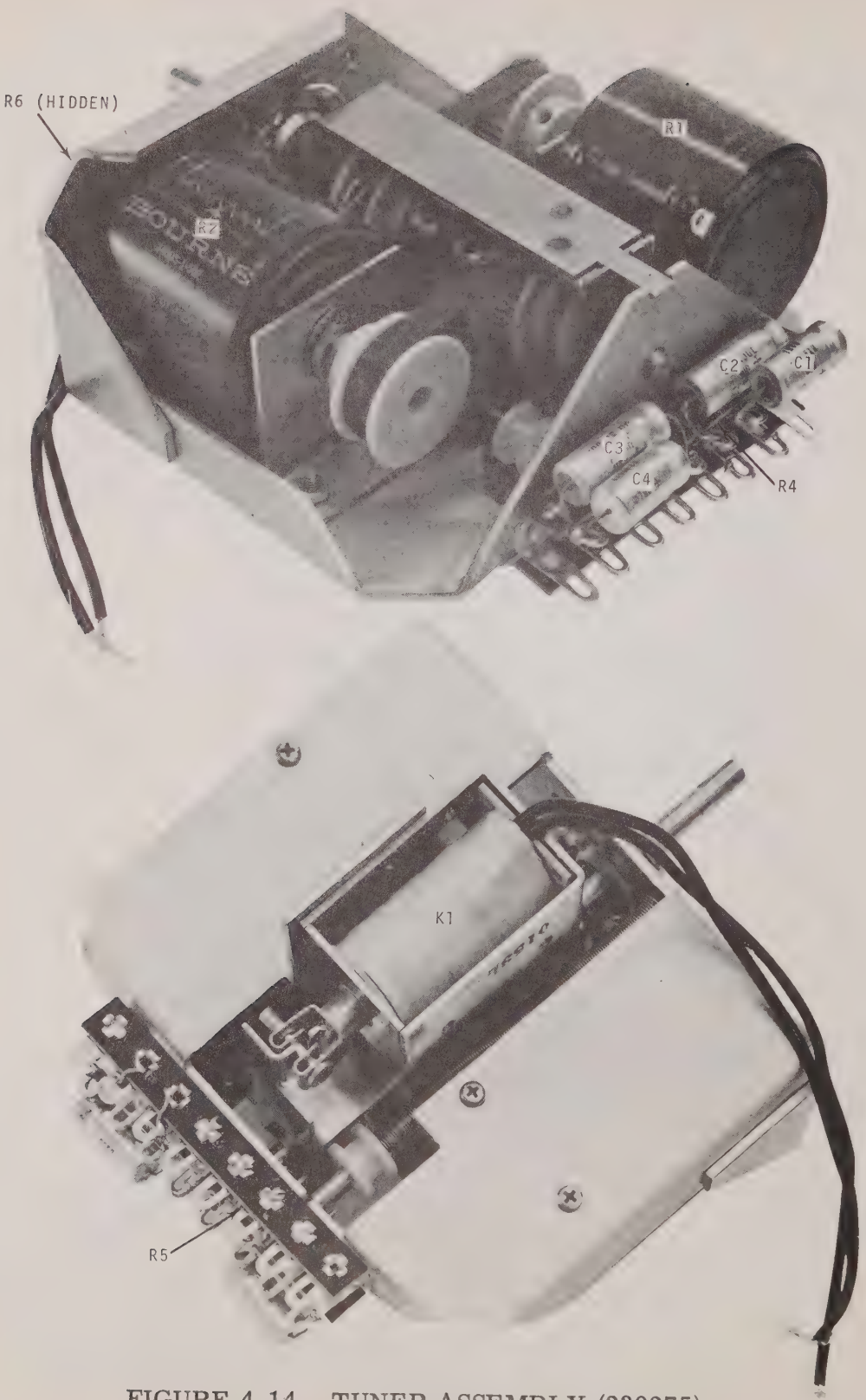


FIGURE 4-14. TUNER ASSEMBLY (230275)

SECTION III. MAIN FRAME ASSEMBLY

This section presents parts location, schematic diagrams, and lists of replaceable parts for the units of the main frame assembly (Figure 4-15).

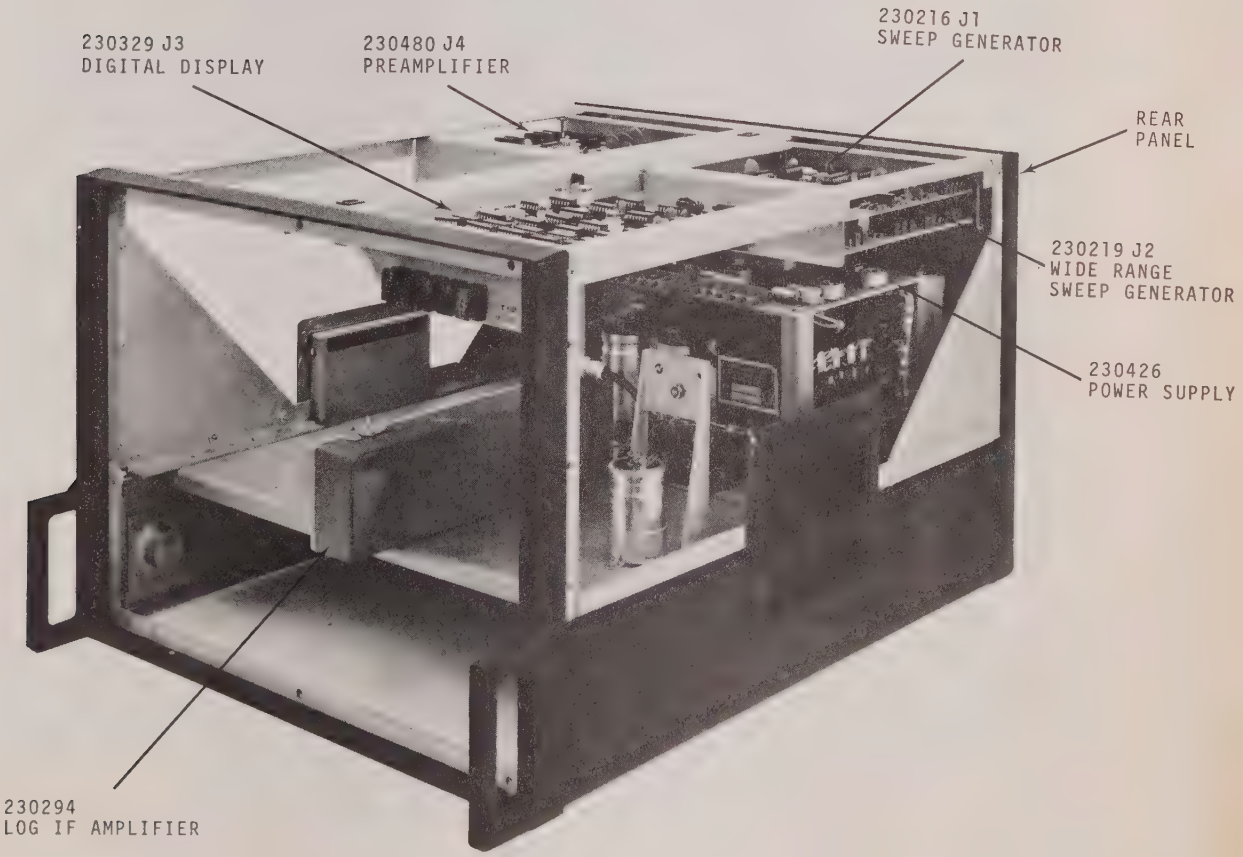


FIGURE 4-15. MAIN FRAME ASSEMBLY

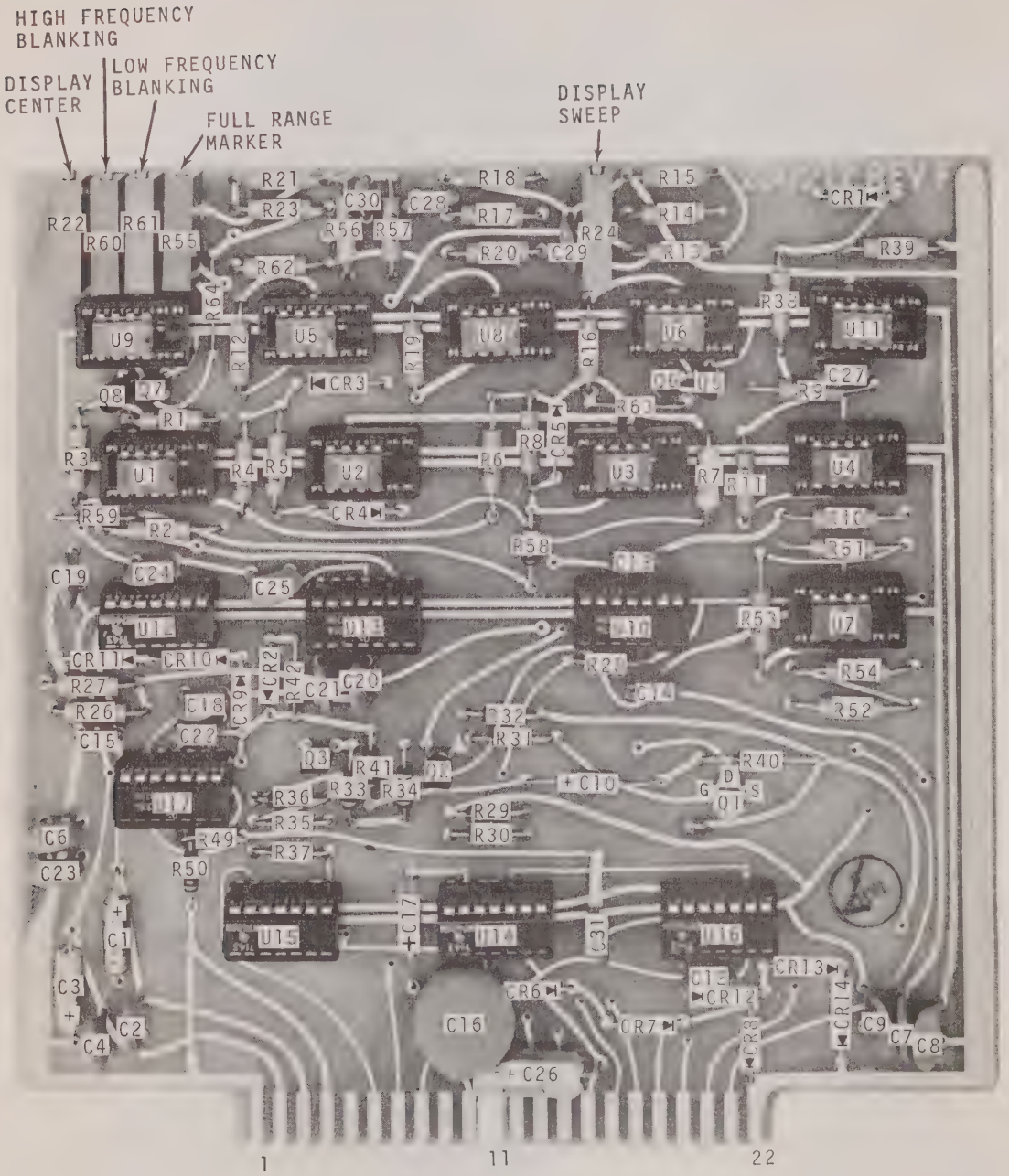
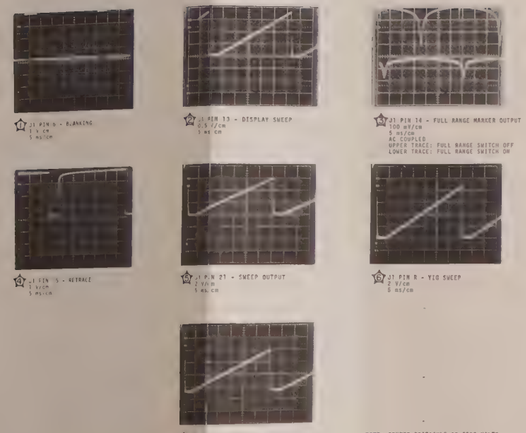


FIGURE 4-16. SWEEP GENERATOR J1 BOARD (230216) (SHEET 1 OF 2)



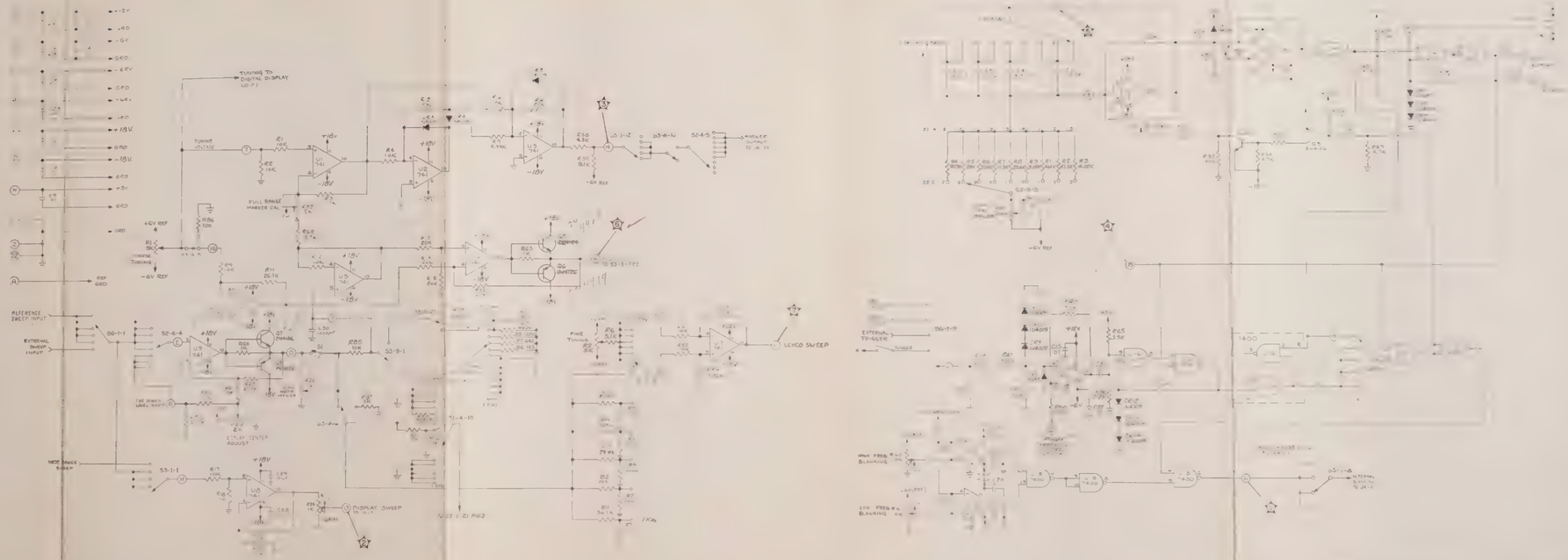


FIGURE 4-16. SWEEP GENERATOR J1 BOARD (230216)

SWEEP GENERATOR J1 BOARD (230216)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 6.8 μF		CS13BF685M
C2	Capacitor, 0.01 μF	Sprague	5HKS-S10
C3	Capacitor, 6.8 μF		CS13BF685M
C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Not used		
C6	Capacitor, 0.01 μF	Sprague	5HKS-S10
C7	Capacitor, 0.01 μF	Sprague	5HKS-S10
C8	Capacitor, 0.01 μF	Sprague	5HKS-S10
C9	Capacitor, 0.01 μF	Sprague	5HKS-S10
C10	Capacitor, 3.3 μF		CS13BD335K
C11	Not used		
C12	Capacitor, 0.01 μF	Sprague	5HKS-S10
C13	Capacitor, 0.01 μF	Sprague	5HKS-S10
C14	Capacitor, 0.01 μF	Sprague	5HKS-S10
C15	Capacitor, 0.01 μF	Sprague	5HKS-S10
C16	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C17	Capacitor, 3.3 μF		CS13BD335K
C18	Capacitor, 0.01 μF	Sprague	5HKS-S10
C19	Capacitor, 0.01 μF	Sprague	5HKS-S10
C20	Capacitor, 0.01 μF	Sprague	5HKS-S10
C21	Capacitor, 0.01 μF	Sprague	5HKS-S10
C22	Capacitor, 0.01 μF	Sprague	5HKS-S10
C23	Capacitor, 0.01 μF	Sprague	5HKS-S10
C24	Capacitor, 0.01 μF	Sprague	5HKS-S10
C25	Capacitor, 0.01 μF	Sprague	5HKS-S10
C26	Capacitor, 100 μF	Sprague	CS13BC107K
C27	Capacitor, 0.01 μF	Sprague	5HKS-S10

SWEEP GENERATOR J1 BOARD (230216) (cont)

Item	Description	Manufacturer	Part No.
C28	Capacitor, 0.01 μF	Sprague	5HKS-S10
C29	Capacitor, 0.01 μF	Sprague	5HKS-S10
C30	Capacitor, 1000 pF	Centralab	DD-102G
C31	Capacitor, 0.01 μF	Sprague	5HKS-S10
CR1	Diode		1N4009
CR2	Diode		1N645
CR3	Diode		1N4009
CR4	Diode		1N4009
CR5	Diode		1N4009
CR6	Diode		1N4009
CR7	Diode		1N4009
CR8	Diode		1N4009
CR9	Diode		1N4009
CR10	Diode		1N4009
CR11	Diode		1N4009
CR12	Diode		1N4009
CR13	Diode		1N4009
CR14	Diode		1N4009
Q1	Transistor		2N4392
Q2	Transistor		2N4124
Q3	Transistor		2N4126
Q4	Not used		
Q5	Transistor		2N4124
Q6	Transistor		2N4126
Q7	Transistor		2N4124
Q8	Transistor		2N4126

Item	Description	Manufacturer	Part No.
R1	Resistor, 10 k, 1/8 W		RN60C1002F
R2	Resistor, 10 k, 1/8 W		RN60C1002F
R3	Resistor, 10 k, 1/8 W		RN60C1002F
R4	Resistor, 10 k, 1/8 W		RN60C1002F
R5	Resistor, 10 k, 1/8 W		RN60C1002F
R6	Resistor, 10 k, 1/8 W		RN60C1002F
R7	Resistor, 4.99 k, 1/8 W		RN60C4991F
R8	Resistor, 20 k, 1/8 W		RN60C2002F
R9	Resistor, 10 k, 1/8 W		RN60C1002F
R10	Resistor, 10 k, 1/8 W		RN60C1002F
R11	Resistor, 26.7 k, 1/8 W		RN60C2672F
R12	Resistor, 10 k, 1/8 W		RN60C1002F
R13	Resistor, 20 k, 1/8 W		RN60C2002F
R14	Resistor, 20 k, 1/8 W		RN60C2002F
R15	Resistor, 20 k, 1/8 W		RN60C2002F
R16	Resistor, 20 k, 1/8 W		RN60C2002F
R17	Resistor, 10 k, 1/8 W		RN60C1002F
R18	Resistor, 10 k, 1/8 W		RN60C1002F
R19	Resistor, 10 k, 1/8 W		RN60C1002F
R20	Resistor, 10 k, 1/8 W		RN60C1002F
R21	Resistor, 10 k, 1/8 W		RN60C1002F
R22	Resistor, variable, 2 k	Bourns	3009P-1-202
R23	Resistor, 41.2 k, 1/8 W		RN60C3122F
R24	Resistor, variable, 1 k	Bourns	3009P-1-102
R25	Not used		
R26	Resistor, 1 k, 1/8 W		RN60C1001F
R27	Resistor, 1 k, 1/8 W		RN60C1001F

Item	Description	Manufacturer	Part No.
R28	Resistor, 100 k, 1/4 W		RC07GF104J
R29	Resistor, 3.9 k, 1/4 W		RC07GF472J
R30	Resistor, 4.7 k, 1/4 W		RC07GF392J
R31	Resistor, 100 k, 1/4 W		RC07GF104J
R32	Resistor, 100 k, 1/4 W		RC07GF104J
R33	Resistor, 10 k, 1/4 W		RC07GF103J
R34	Resistor, 4.7 k, 1/4 W		RC07GF472J
R35	Resistor, 3 k, 1/4 W		RC07GF302J
R36	Resistor, 16 k, 1/4 W		RC07GF163J
R37	Resistor, 4.7 k, 1/4 W		RC07GF472J
R38	Resistor, 1 k, 1/8 W		RN60C1001F
R39	Resistor, 1 k, 1/8 W		RN60C1001F
R40	Resistor, 4.7 k, 1/4 W		RC07GF472J
R41	Resistor, 510, 1/4 W		RC07GF511J
R42	Resistor, 5.1 k, 1/4 W		RC07GF512J
R43	Not used		
R44	Not used		
R45	Not used		
R46	Not used		
R47	Not used		
R48	Not used		
R49	Resistor, 5.1 k, 1/4 W		RC07GF512J
R50	Resistor, 200, 1/4 W		RC07GF201J
R51	Resistor, 10 k, 1/8 W		RN60C1002F
R52	Resistor, 10 k, 1/8 W		RN60C1002F
R53	Resistor, 20 k, 1/8 W		RN60C2002F
R54	Resistor, 3.32 k, 1/8 W		RN60C3321F

SWEEP GENERATOR J1 BOARD (230216) (cont)

Item	Description	Manufacturer	Part No.
R55	Resistor, variable, 5 k	Bourns	3009P-1-502
R56	Resistor, 10 k, 1/8 W		RN60C1002F
R57	Resistor, 41.2 k, 1/8 W		RN60C4122F
R58	Resistor, 4.3 k, 1/4 W		RC07GF432J
R59	Resistor, 7.5 k, 1/4 W		RC07GF752J
R60	Resistor, variable, 10 k	Bourns	3009P-1-103
R61	Resistor, variable, 10 k	Bourns	3009P-1-103
R62	Resistor, 13.7 k, 1/8 W		RN60C1372F
R63	Resistor, 1 k, 1/4 W		RC07GF102J
R64	Resistor, 1 k, 1/4 W		RC07GF102J
R65	Resistor, 3.9 k, 1/4 W		RC07GF392J
R66	Resistor, 3.9 k, 1/4 W		RC07GF392J
U1	IC	TI	SN72741P
U2	IC	TI	SN72741P
U3	IC	TI	SN72741P
U4	IC	TI	SN72741P
U5	IC	TI	SN72741P
U6	IC	TI	SN72741P
U7	IC	TI	SN72741P
U8	IC	TI	SN72741P
U9	IC	TI	SN72741P
U10	IC	TI	SN72710N
U11	IC	TI	SN72741P
U12	IC	TI	SN72710N
U13	IC	TI	SN72710N
U14	IC	TI	SN7400N

SWEEP GENERATOR J1 BOARD (230216) (cont)

Item	Description	Manufacturer	Part No.
U15	IC	TI	SN7400N
U16	IC	TI	SN7400N
U17	IC	TI	SN72710N

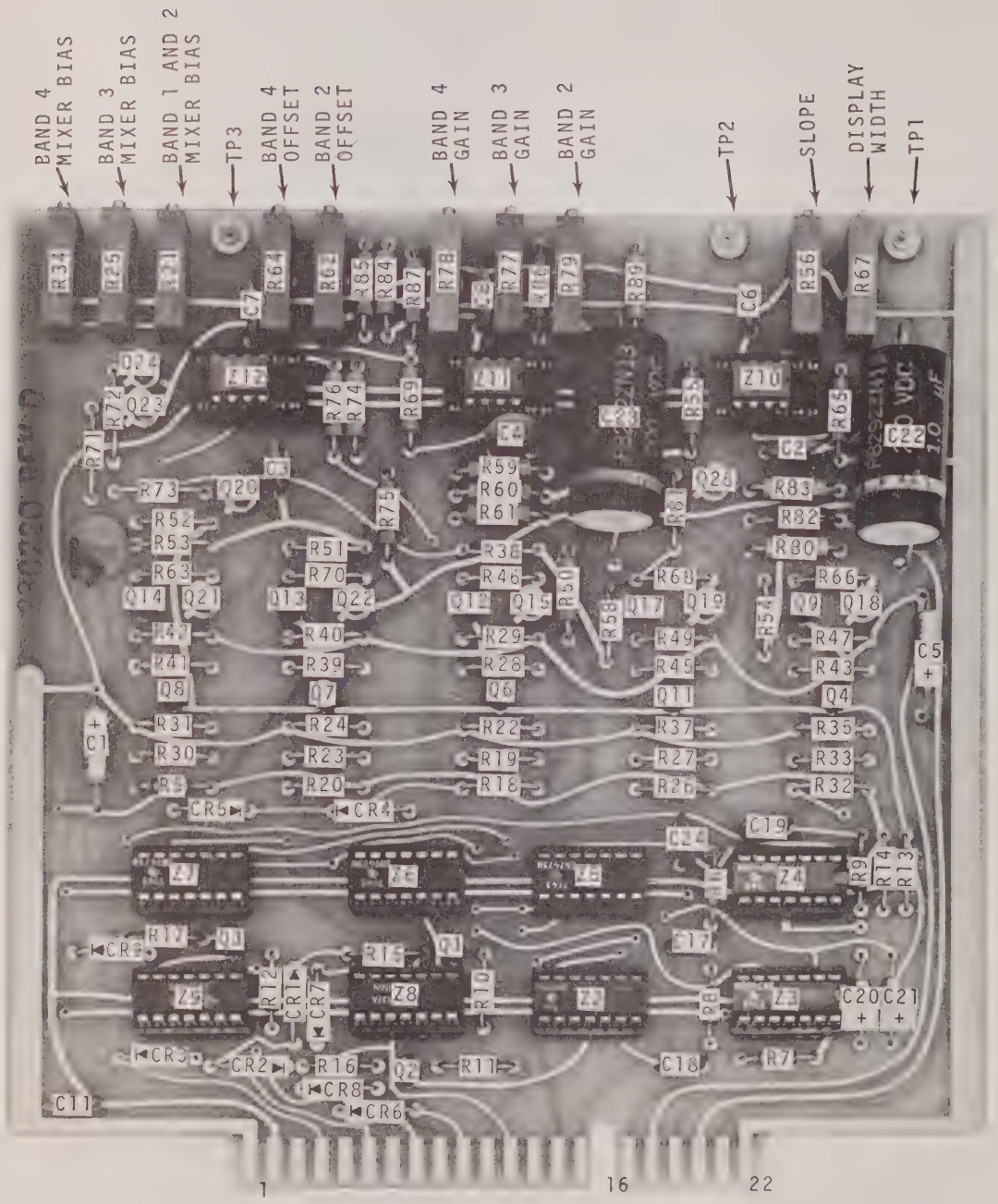
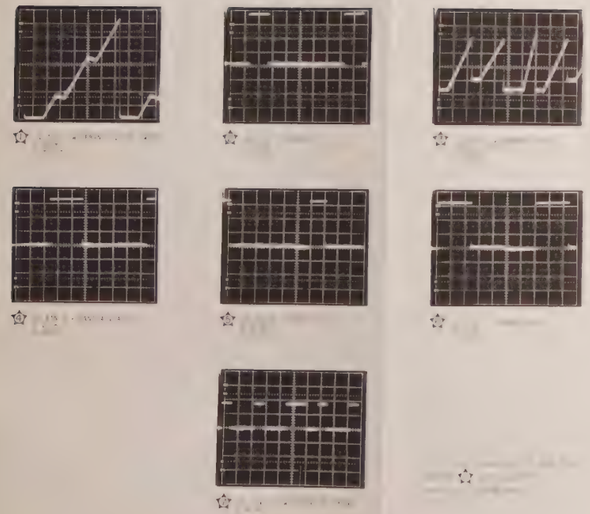


FIGURE 4-17. WIDE RANGE SWEEP GENERATOR J2 BOARD (230219) (SHEET 1 OF 2)



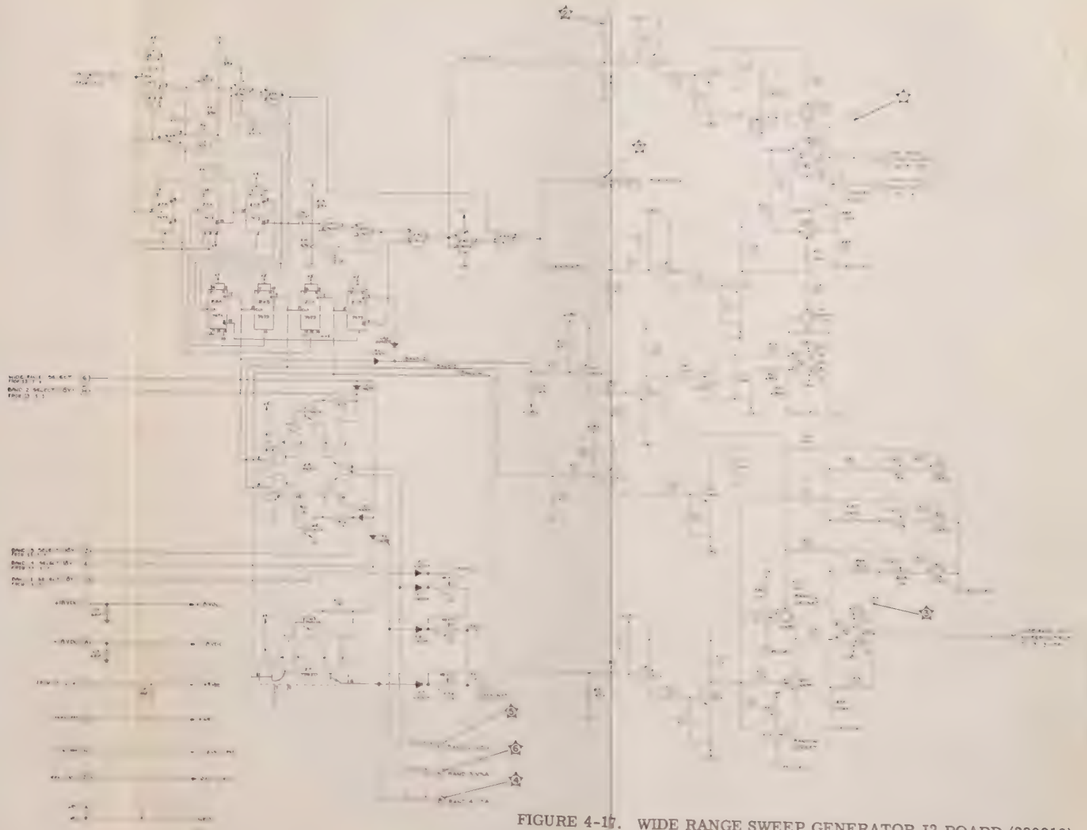


FIGURE 4-17. WIDE RANGE SWEEP GENERATOR J2 BOARD (230219)

WIDE RANGE SWEEP GENERATOR J2 BOARD (230219)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 6.8 μF		CS13BF685M
C2	Capacitor, 0.01 μF	Sprague	5HKS-S10
C3	Capacitor, 0.01 μF	Sprague	5HKS-S10
C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Capacitor, 6.8 μF		CS13BF685M
C6	Capacitor, 0.01 μF	Sprague	5HKS-S10
C7	Capacitor, 0.01 μF	Sprague	5HKS-S10
C8	Capacitor, 0.01 μF	Sprague	5HKS-S10
C9	Not used		
C10	Not used		
C11	Capacitor, 0.01 μF	Sprague	5HKS-S10
C12	Not used		
C13	Not used		
C14	Not used		
C15	Not used		
C16	Not used		
C17	Capacitor, 0.003 μF	Centralab	DD-302
C18	Capacitor, 0.003 μF	Centralab	DD-302
C19	Capacitor, 0.003 μF	Centralab	DD-302
C20	Capacitor, 3.3 μF		CS13BD335K
C21	Capacitor, 1.2 μF		CS13BE125K
C22	Capacitor, 1.0 μF	Aerovox	P8292ZN13
C23	Capacitor, 1.0 μF	Aerovox	P8292ZN13
C24	Capacitor, 1000 pF	Centralab	DD-102G
CR1	Diode		1N4009
CR2	Diode		1N4009

WIDE RANGE SWEEP GENERATOR J2 BOARD (230219) (cont)

Item	Description	Manufacturer	Part No.
CR3	Diode		1N4009
CR4	Diode		1N4009
CR5	Diode		1N4009
CR6	Diode		1N4009
CR7	Diode		1N4009
CR8	Diode		1N4009
CR9	Diode		1N4009
Q1	Transistor		2N4124
Q2	Transistor		2N4124
Q3	Transistor		2N4124
Q4	Transistor		2N4126
Q5	Not used		
Q6	Transistor		2N4126
Q7	Transistor		2N4126
Q8	Transistor		2N4126
Q9	Transistor		2N4124
Q10	Not used		
Q11	Transistor		2N4126
Q12	Transistor		2N4124
Q13	Transistor		2N4124
Q14	Transistor		2N4124
Q15	Transistor		2N4392
Q16	Not used		
Q17	Transistor		2N4124
Q18	Transistor		2N4392
Q19	Transistor		2N4392

Item	Description	Manufacturer	Part No.
Q20	Transistor		2N4392
Q21	Transistor		2N4392
Q22	Transistor		2N4392
Q23	Transistor		2N4392
Q24	Transistor		2N4392
Q25	Transistor		2N4392
R1	Not used		
R2	Not used		
R3	Not used		
R4	Not used		
R5	Resistor, 4.7 k, 1/4 W		RC07GF472J
R6	Resistor, 1 k, 1/4 W		RC07GF102J
R7	Resistor, 3.9 k, 1/4 W		RC07GF392J
R8	Resistor, 3.9 k, 1/4W		RC07GF392J
R9	Resistor, 1 k, 1/4 W		RC07GF102J
R10	Resistor, 1 k, 1/4 W		RC07GF102J
R11	Resistor, 1 k, 1/4 W		RC07GF102J
R12	Resistor, 1 k, 1/4 W		RC07GF102J
R13	Resistor, 3.9 k, 1/4 W		RC07GF392J
R14	Resistor, 4.7 k, 1/4 W		RC07GF472J
R15	Resistor, 1 k, 1/4 W		RC07GF102J
R16	Resistor, 1 k, 1/4 W		RC07GF102J
R17	Resistor, 1 k, 1/4 W		RC07GF102J
R18	Resistor, 16 k, 1/4 W		RC07GF163J
R19	Resistor, 3 k, 1/4 W		RC07GF302J
R20	Resistor, 4.7 k, 1/4 W		RC07GF472J

WIDE RANGE SWEEP GENERATOR J2 BOARD (230219) (cont)

Item	Description	Manufacturer	Part No.
R21	Resistor, variable, 10 k	Bourns	3009P-1-103
R22	Resistor, 16 k, 1/4 W		RC07GF163J
R23	Resistor, 3 k, 1/4 W		RC07GF302J
R24	Resistor, 16 k, 1/4 W		RC07GF163J
R25	Resistor, variable, 10 k	Bourns	3009P-1-103
R26	Resistor, 4.7 k, 1/4 W		RC07GF472J
R27	Resistor, 3 k, 1/4 W		RC07GF302J
R28	Resistor, 10 k, 1/4 W		RC07GF103J
R29	Resistor, 4.7 k, 1/4 W		RC07GF472J
R30	Resistor, 3 k, 1/4 W		RC07GF302J
R31	Resistor, 16 k, 1/4 W		RC07GF163J
R32	Resistor, 4.7 k, 1/4 W		RC07GF472J
R33	Resistor, 3 k, 1/4 W		RC07GF302J
R34	Resistor, variable, 10 k	Bourns	3009P-1-103
R35	Resistor, 16 k, 1/4 W		RC07GF163J
R36	Not used		
R37	Resistor, 16 k, 1/4 W		RC07GF163J
R38	Resistor, 10 k, 1/4 W		RC07GF103J
R39	Resistor, 10 k, 1/4 W		RC07GF103J
R40	Resistor, 4.7 k, 1/4 W		RC07GF472J
R41	Resistor, 10 k, 1/4 W		RC07GF103J
R42	Resistor, 4.7 k, 1/4 W		RC07GF472J
R43	Resistor, 10 k, 1/4 W		RC07GF103J
R44	Not used		
R45	Resistor, 10 k, 1/4 W		RC07GF103J
R46	Resistor, 100 k, 1/4 W		RC07GF104J
R47	Resistor, 4.7 k, 1/4 W		RC07GF472J

Item	Description	Manufacturer	Part No.
R48	Not used		
R49	Resistor, 4.7 k, 1/4 W		RC07GF472J
R50	Resistor, 2 k, 1/8 W		RN60C2001F
R51	Resistor, 100 k, 1/4 W		RC07GF104J
R52	Resistor, 9.1 k, 1/4 W		RC07GF912J
R53	Resistor, 100 k, 1/4 W		RC07GF104J
R54	Resistor, 100 k, 1/4 W		RC07GF104J
R55	Resistor, 7.5 k, 1/8 W		RN60C7501F
R56	Resistor, variable, 2 k	Bourns	3009P-1-202
R57	Not used		
R58	Resistor, 100 k, 1/4 W		RC07GF104J
R59	Resistor, 2 k, 1/8 W		RN60C2001F
R60	Resistor, 4.99 k, 1/8 W		RN60C4991F
R61	Resistor, 4.99 k, 1/8 W		RN60C4991F
R62	Resistor, variable, 2 k	Bourns	3009P-1-202
R63	Resistor, 100 k, 1/4 W		RC07GF104J
R64	Resistor, variable, 2 k	Bourns	3009P-1-202
R65	Resistor, 10 k, 1/8 W		RN60C1002F
R66	Resistor, 100 k, 1/4 W		RC07GF104J
R67	Resistor, variable, 5 k	Bourns	3009P-1-502
R68	Resistor, 100 k, 1/4 W		RC07GF104J
R69	Resistor, 10 k, 1/8 W		RN60C1002F
R70	Resistor, 100 k, 1/4 W		RC07GF104J
R71	Resistor, 100 k, 1/4 W		RC07GF104J
R72	Resistor, 100 k, 1/4 W		RC07GF104J
R73	Resistor, 100 k, 1/4 W		RC07GF104J
R74	Resistor, 10 k, 1/8 W		RN60C1002F

WIDE RANGE SWEEP GENERATOR J2 BOARD (230219) (cont)

Item	Description	Manufacturer	Part No.
R75	Resistor, 2.74 k, 1/8 W		RN60C2741F
R76	Resistor, 10 k, 1/8 W		RN60C1002F
R77	Resistor, variable, 5 k	Bourns	3009P-1-502
R78	Resistor, variable, 1 k	Bourns	3009P-1-102
R79	Resistor, variable, 5 k	Bourns	3009P-1-502
R80	Resistor, 1 k, 1/8 W		RN60C1001F
R81	Resistor, 100 k, 1/4 W		RC07GF104J
R82	Resistor, 1.1 k, 1/8 W		RN60C1101F
R83	Resistor, 221, 1/8 W		RN60C2210F
R84	Resistor, 10 k, 1/8 W		RN60C1002F
R85	Resistor, 4.99 k, 1/8 W		RN60C4991F
R86	Resistor, 2 k, 1/8 W		RN60C2001F
R87	Resistor, 1 k, 1/8 W		RN60C1001F
R88	Not used		
R89	Resistor, 1.5 k, 1/8 W		RN60C1501F
Z1	Not used		
Z2	IC	TI	SN7473N
Z3	IC	TI	SN7400N
Z4	IC	TI	SN7400N
Z5	IC	TI	SN7473N
Z6	IC	TI	SN7473N
Z7	IC	TI	SN7473N
Z8	IC	TI	SN75450N
Z9	IC	TI	SN75450N
Z10	IC	TI	SN72741P
Z11	IC	TI	SN72741P
Z12	IC	TI	SN72741P

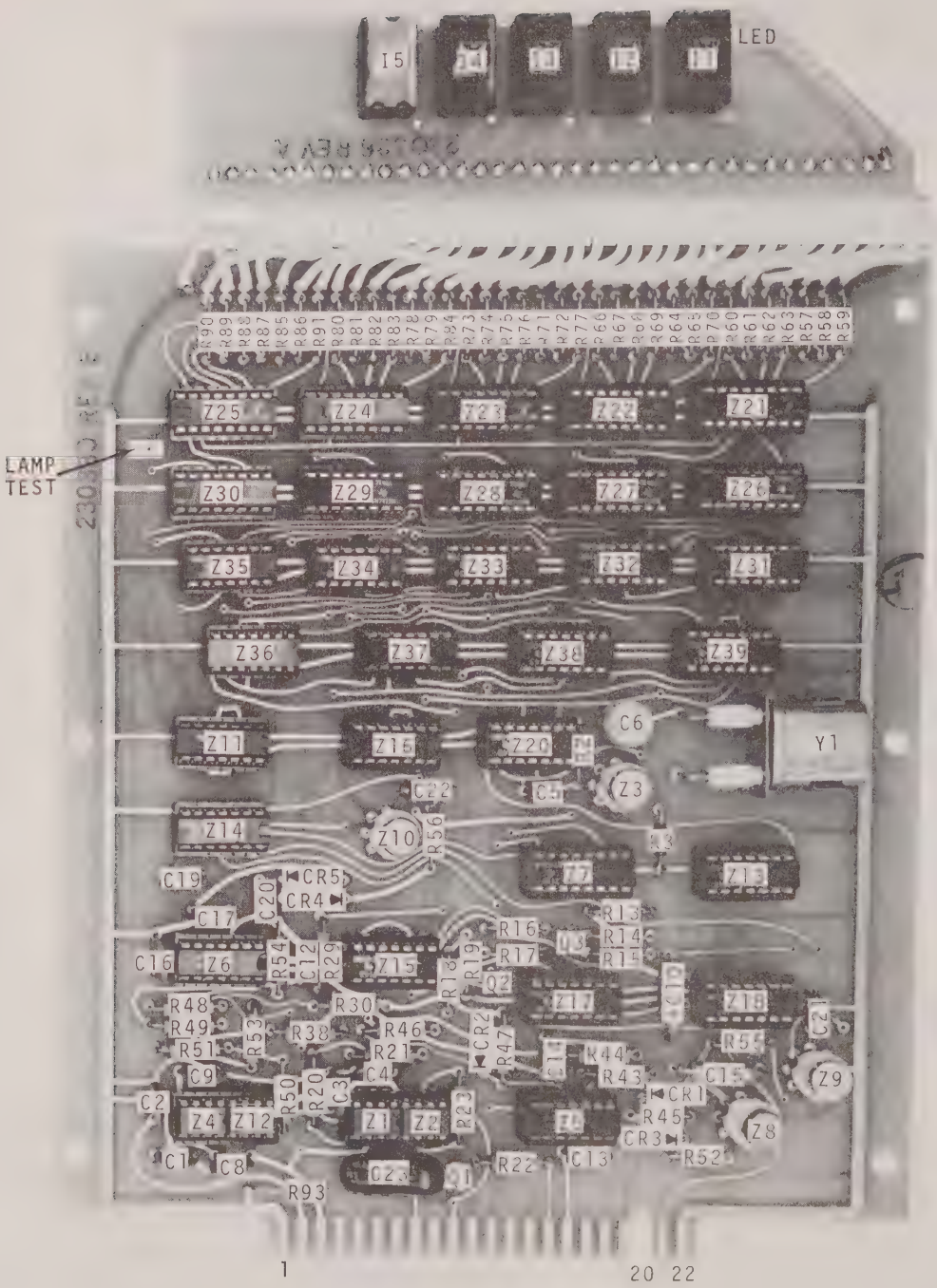
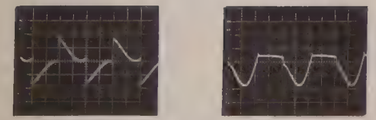
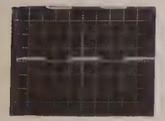


FIGURE 4-18. DIGITAL DISPLAY J3 BOARD (230329) (SHEET 1 OF 2)

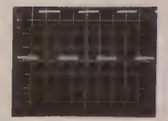


☆ J3 BETWEEN CAPACITOR C6 AND CRYSTAL Y1
2 V/cm
1 us/cm

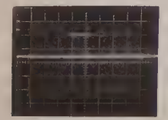
☆ J3 23 PIN 5
2 V/cm
1 us/cm



☆ J3 213 PIN 14
1 V/cm
1 us/cm

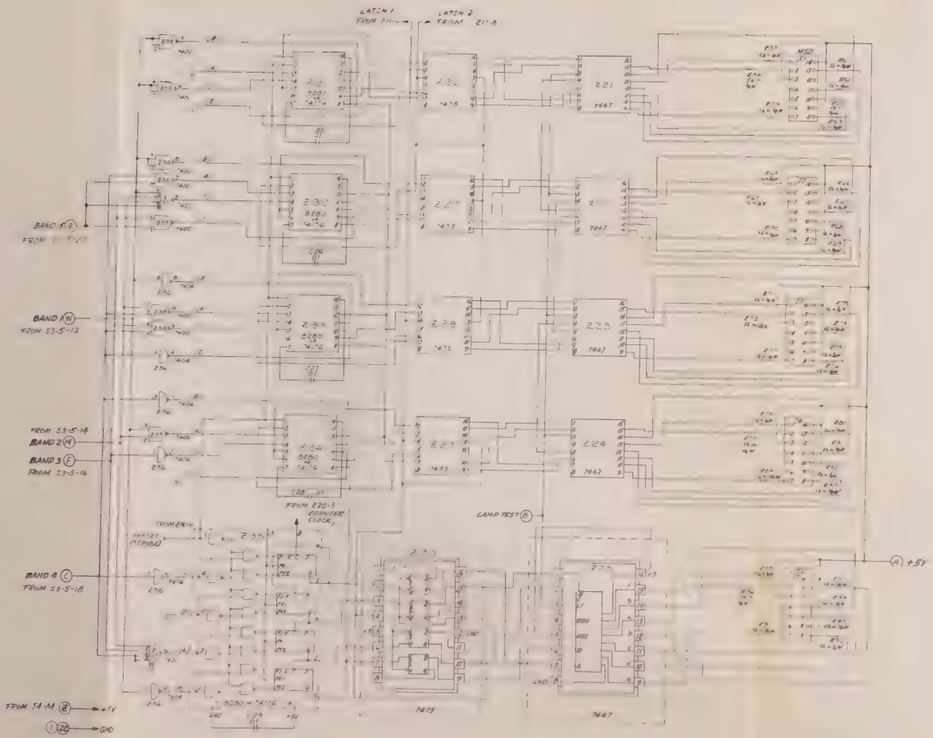


☆ J3 PIN 21 - 100-Hz CLOCK
1 V/cm
2 ms/cm



☆ J3 214 PINS 4 AND 5
2 V/cm
5 ms/cm
Ai SYNC

NOTE: CENTER GRATICULE IS ZERO VOLTS.



NOTES:
1. ON 8080 OR 74176, PIN 7 IS GND & PIN 14 IS +5V.
2. UNLESS OTHERWISE SAID, PIN 5 IS +5V.
3. UNLESS 7447N PIN 8 IS GND & PIN 16 IS +5V.
4. ON 7400, 7404, 7420, 7440 PIN 7 IS GND & PIN 14 IS +5V.
5. ON ALL 9N43 PIN 4 IS GND & PIN 8 IS +8V.

FIGURE 4-18. DIGITAL DISPLAY J3 BOARD (230329)

DIGITAL DISPLAY J3 BOARD (230329)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 0.01 μF	Sprague	5HKS-S10
C2	Capacitor, 0.01 μF	Sprague	5HKS-S10
C3	Capacitor, 0.01 μF	Sprague	5HKS-S10
C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Capacitor, 820 pF	Centralab	DD-821
C6	Capacitor, 15-60 pF	Erie	538-011-F15-60
C7	Not used		
C8	Capacitor, 0.01 μF	Sprague	5HKS-S10
C9	Capacitor, 0.01 μF	Sprague	5HKS-S10
C10	Capacitor, 27 μF		CS13BC276K
C11	Not used		
C12	Capacitor, 0.01 μF	Sprague	5HKS-S10
C13	Capacitor, 0.01 μF	Sprague	5HKS-S10
C14	Capacitor, 0.01 μF	Sprague	5HKS-S10
C15	Capacitor, 27 μF		CS13BC276K
C16	Capacitor, 0.01 μF	Sprague	5HKS-S10
C17	Capacitor, 0.01 μF	Sprague	5HKS-S10
C18	Not used		
C19	Capacitor, 0.01 μF	Sprague	5HKS-S10
C20	Capacitor, 0.01 μF	Sprague	5HKS-S10
C21	Capacitor, 0.01 μF	Sprague	5HKS-S10
C22	Capacitor, 0.01 μF	Sprague	5HKS-S10
C23	Capacitor, 0.1 μF, ±2%, 100 V	Elmenco	1DP-2-104G
C24	Not used		
C25	Capacitor, 0.01 μF	Sprague	5HKS-S10
C26	Capacitor, 0.01 μF	Sprague	5HKS-S10

DIGITAL DISPLAY J3 BOARD (230329) (cont)

Item	Description	Manufacturer	Part No.
C27	Capacitor, 0.01 μF	Sprague	5HKS-S10
C28	Capacitor, 0.01 μF	Sprague	5HKS-S10
C29	Capacitor, 0.01 μF	Sprague	5HKS-S10
CR1	Diode		1N4009
CR2	Diode		1N4009
CR3	Diode		1N4009
CR4	Diode		1N4009
CR5	Diode		1N4009
I1-5	LED readout	Monsanto	MAN 1
Q1	Transistor		2N4392
Q2	Transistor		2N4124
Q3	Transistor		2N4126
R1	Not used		
R2	Resistor, 56 k, 1/4 W		RC07GF563J
R3	Resistor, 56 K, 1/4 W		RC07GF563J
R4	Not used		
R5	Not used		
R6	Not used		
R7	Not used		
R8	Not used		
R9	Not used		
R10	Not used		
R11	Not used		
R12	Not used		
R13	Resistor, 4.7 k, 1/4 W		RC07GF472J
R14	Resistor, 3 k, 1/4 W		RC07GF302J
R15	Resistor, 16 k, 1/4 W		RC07GF163J

DIGITAL DISPLAY J3 BOARD (230329) (cont)

Item	Description	Manufacturer	Part No.
R16	Resistor, 10 k, 1/4 W		RC07GF103J
R17	Resistor, 4.7 k, 1/4 W		RC07GF472J
R18	Resistor, 100 k, 1/4 W		RC07GF104J
R19	Resistor, 100 k, 1/4 W		RC07GF104J
R20	Resistor, 13.3 k, 1/8 W		RN60C1332F
R21	Resistor, 16.2 k, 1/8 W		RN60C1622F
R22	Resistor, 10 k, 1/8 W		RN60C1002F
R23	Resistor, 26.7 k, 1/8 W		RN60C2672F
R24	Not used		
R25	Not used		
R26	Not used		
R27	Not used		
R28	Not used		
R29	Resistor, 20 k, 1/8 W		RN60C2002F
R30	Resistor, 20 k, 1/8 W		RN60C2002F
R31	Not used		
R32	Not used		
R33	Not used		
R34	Not used		
R35	Not used		
R36	Not used		
R37	Not used		
R38	Resistor, 1.5 k, 1/8 W		RN60C1501F
R39	Not used		
R40	Not used		
R41	Not used		
R42	Not used		
R43	Resistor, 4.64 k, 1/8 W		RN60C4641F

DIGITAL DISPLAY J3 BOARD (230329) (cont)

Item	Description	Manufacturer	Part No.
R44	Resistor, 16.5 k, 1/8 W		RN60C1652F
R45	Resistor, 15 k, 1/4 W		RC07GF153J
R46	Resistor, 15 k, 1/8 W		RN60C1502F
R47	Resistor, 4.99 k, 1/8 W		RN60C4991F
R48	Resistor, 10 k, 1/8 W		RN60C1002F
R49	Resistor, 10 k, 1/8 W		RN60C1002F
R50	Resistor, 10 k, 1/8 W		RN60C1002F
R51	Resistor, 10 k, 1/8 W		RN60C1002F
R52	Resistor, 15 k, 1/4 W		RC07GF153J
R53	Resistor, 100, 1/8 W		RN60C1000F
R54	Resistor, 100, 1/8 W		RN60C1000F
R55	Resistor, 2.4 k, 1/4 W		RC07GF242J
R56	Resistor, 1.5 k, 1/4 W		RC07GF152J
R57	Resistor, 56, 1/4 W		RC07GF560J
R58	Resistor, 56, 1/4 W		RC07GF560J
R59	Resistor, 56, 1/4 W		RC07GF560J
R60	Resistor, 56, 1/4 W		RC07GF560J
R61	Resistor, 56, 1/4 W		RC07GF560J
R62	Resistor, 56, 1/4 W		RC07GF560J
R63	Resistor, 56, 1/4 W		RC07GF560J
R64	Resistor, 56, 1/4 W		RC07GF560J
R65	Resistor, 56, 1/4 W		RC07GF560J
R66	Resistor, 56, 1/4 W		RC07GF560J
R67	Resistor, 56, 1/4 W		RC07GF560J
R68	Resistor, 56, 1/4 W		RC07GF560J
R69	Resistor, 56, 1/4 W		RC07GF560J
R70	Resistor, 56, 1/4 W		RC07GF560J

DIGITAL DISPLAY J3 BOARD (230329) (cont)

Item	Description	Manufacturer	Part No.
R71	Resistor, 56, 1/4 W		RC07GF560J
R72	Resistor, 56, 1/4 W		RC07GF560J
R73	Resistor, 56, 1/4 W		RC07GF560J
R74	Resistor, 56, 1/4 W		RC07GF560J
R75	Resistor, 56, 1/4 W		RC07GF560J
R76	Resistor, 56, 1/4 W		RC07GF560J
R77	Resistor, 56, 1/4 W		RC07GF560J
R78	Resistor, 56, 1/4 W		RC07GF560J
R79	Resistor, 56, 1/4 W		RC07GF560J
R80	Resistor, 56, 1/4 W		RC07GF560J
R81	Resistor, 56, 1/4 W		RC07GF560J
R82	Resistor, 56, 1/4 W		RC07GF560J
R83	Resistor, 56, 1/4 W		RC07GF560J
R84	Resistor, 56, 1/4 W		RC07GF560J
R85	Resistor, 56, 1/4 W		RC07GF560J
R86	Resistor, 56, 1/4 W		RC07GF560J
R87	Resistor, 56, 1/4 W		RC07GF560J
R88	Resistor, 56, 1/4 W		RC07GF560J
R89	Resistor, 56, 1/4 W		RC07GF560J
R90	Resistor, 56, 1/4 W		RC07GF560J
R91	Resistor, 56, 1/4 W		RC07GF560J
R92	Resistor, 51 k, 1/4 W		RC07GF513J
R93	Resistor, 100 k, 1/4 W		RC07GF104J
Y1	Crystal, 250 kHz	Piezo	230479-5
Z1	IC	TI	SN72741P
Z2	IC	TI	SN72741P

DIGITAL DISPLAY J3 BOARD (230329) (cont)

Item	Description	Manufacturer	Part No.
Z3	IC	Fairchild	U5B991429
Z4	IC	TI	SN72741P
Z5, Z6	IC	TI	SN72710N
Z7	IC	TI	SN7476N
Z8, Z9, Z10	IC	Fairchild	U5B991429
Z11	IC	TI	SN7440N
Z12	IC	TI	SN72741P
Z13	IC	TI	SN7492N
Z14, Z15, Z16	IC	TI	SN7400N
Z17, Z18	IC	TI	SN7492N
Z19	Not used		
Z20	IC	TI	SN7400N
Z21, Z22, Z23, Z24, Z25	IC	TI	SN7447N
Z26, Z27, Z28, Z29, Z30	IC	TI	SN7475N
Z31, Z32, Z33, Z34, Z35	IC	TI	SN74176N
Z36, Z37	IC	TI	SN7404N
Z38, Z39	IC	TI	SN7400N

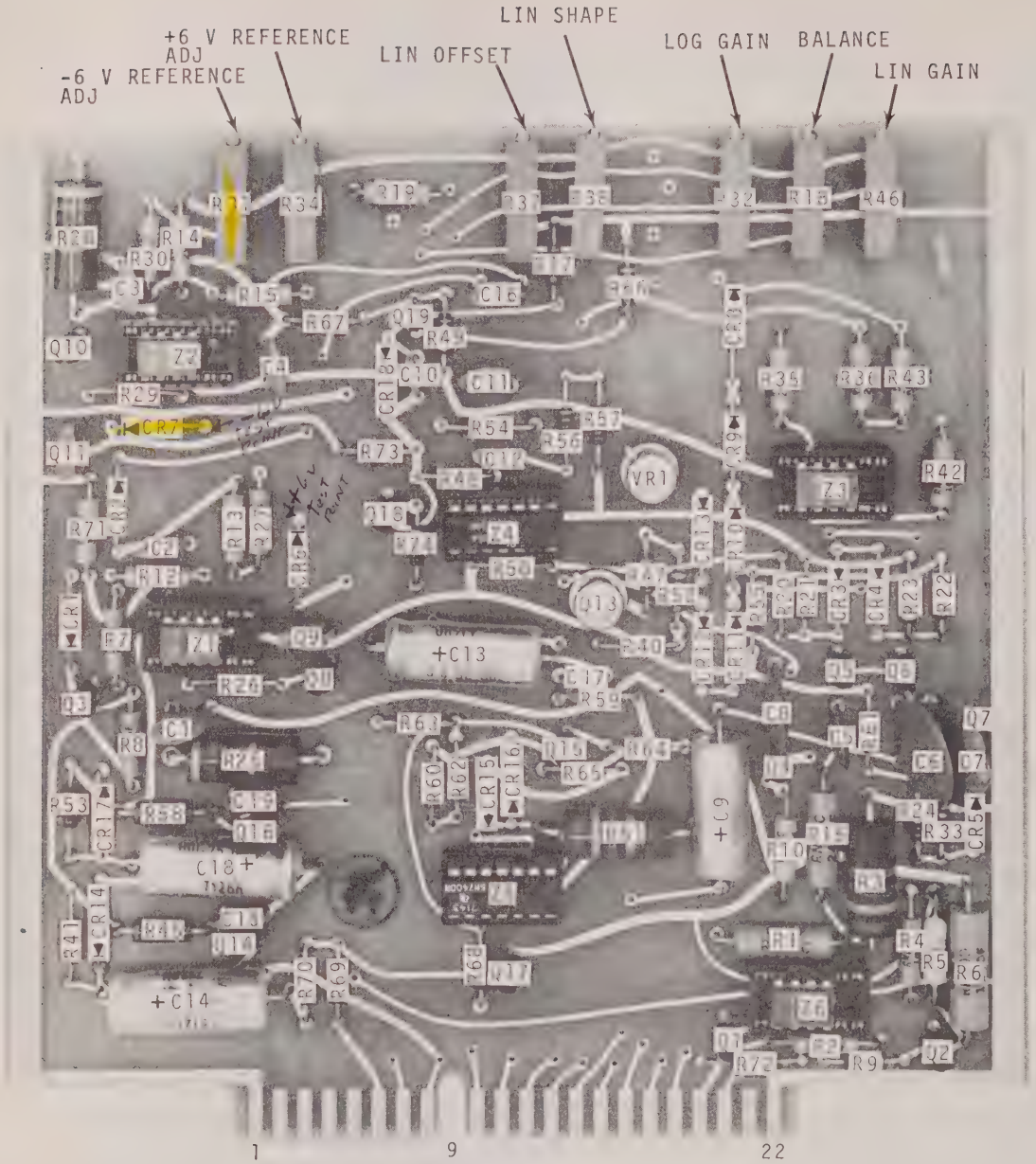
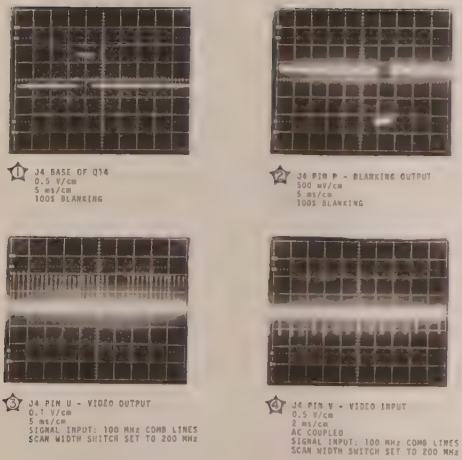


FIGURE 4-19. PREAMPLIFIER J4 BOARD (230480) (SHEET 1 OF 2)


1 J4 BASE OF Q14
0.5 V/cm
5 ns/cm
100% BLANKING
2 J4 PIN P - BLANKING OUTPUT
100 mV/cm
5 ns/cm
100% BLANKING
3 J4 PIN U - VIDEO OUTPUT
0.7 V/cm
5 ns/cm
SIGNAL INPUT: 100 MHz COMB LINES
SCAN WIDTH SWITCH SET TO 200 MHz
4 J4 PIN V - VIDEO INPUT
0.5 V/cm
2 ns/cm
AC COUPLED
SIGNAL INPUT: 100 MHz COMB LINES
SCAN WIDTH SWITCH SET TO 200 MHz
NOTE: CENTER GRATICULE IS ZERO VOLTS.

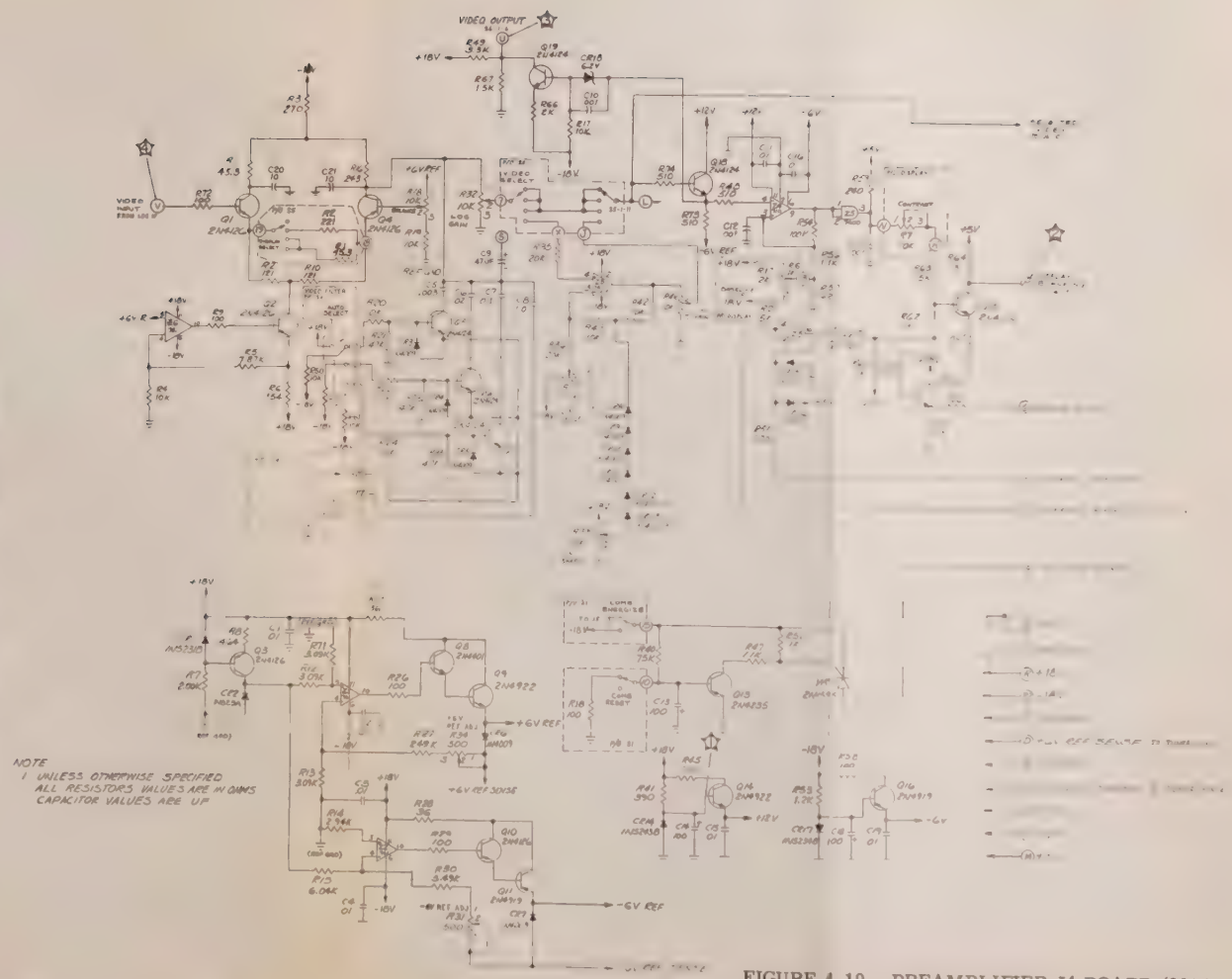


FIGURE 4-19. PREAMPLIFIER J4 BOARD (230480)

PREAMPLIFIER J4 BOARD (230480)

Item	Description	Manufacturer	Part No.
C1 thru C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Capacitor, 0.003 μF	Centralab	DD-302
C6	Capacitor, 0.02 μF	Centralab	DD-203
C7	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C8	Capacitor, 1.0 μF, 3 V	Centralab	UK-105
C9	Capacitor, 47 μF, 35 V	Kemet	CS13BF476K
C10	Capacitor, 0.001 μF		CK60AW102M
C11	Capacitor, 0.01 μF	Sprague	5HKS-S10
C12	Capacitor, 0.001 μF		CK60AW102M
C13, C14	Capacitor, 100 μF, 25 V	Sprague	TE-1211
C15, C16	Capacitor, 0.01 μF	Sprague	5HKS-S10
C17	Capacitor, 0.001 μF		CK60AW102M
C18	Capacitor, 100 μF, 25 V	Sprague	TE-1211
C19	Capacitor, 0.01 μF	Sprague	5HKS-S10
C20, C21	Capacitor, 10 pF	Centralab	DD-100
CR1	Diode		1N5231B
CR2	Diode		1N825A
CR3 thru CR13	Diode		1N4009
CR14	Diode		1N5243B
CR15, CR16	Diode		1N2071 (114233-2)
CR17	Diode		1N5234B
CR18	Diode		1N825A
Q1 thru Q4	Transistor		2N4126
Q5, Q6, Q7	Transistor		2N4124

PREAMPLIFIER J4 BOARD (230480) (cont)

Item	Description	Manufacturer	Part No.
Q8	Transistor		2N4401
Q9	Transistor		2N4922
Q10	Transistor		2N4126
Q11	Transistor		2N4919
Q12	Not used		
Q13	Transistor		2N4235
Q14	Transistor		2N4922
Q15	Transistor		2N4124
Q16	Transistor		2N4919
Q17, Q18, Q19	Transistor		2N4124
R1	Resistor, 243, 1/4 W		RN65C2430F
R2	Resistor, 121, 1/8 W		RN60C1210F
R3	Resistor, 270, 2 W		RC42GF271J
R4	Resistor, 10 k, 1/8 W		RN60C1002F
R5	Resistor, 7.87 k, 1/8 W		RN60C7871F
R6	Resistor, 154, 1/2 W		RN70D1540F
R7	Resistor, 2 k, 1/8 W		RN60C2001F
R8	Resistor, 464, 1/8 W		RN60C4640F
R9	Resistor, 100, 1/4 W		RC07GF101J
R10	Resistor, 121, 1/8 W		RN60C1210F
R11	Not used		
R12, R13	Resistor, 3.09 k, 1/8 W		RN60C3091F
R14	Resistor, 2.94 k, 1/8 W		RN60C2941F
R15	Resistor, 6.04 k, 1/8 W		RN60C6041F
R16	Resistor, 243, 1/4 W		RN65C2430F
R17	Resistor, 10 k, 1/4 W		RC07GF103J

PREAMPLIFIER J4 BOARD (230480) (cont)

Item	Description	Manufacturer	Part No.
R18	Resistor, variable, 10 k		3009-P-103
R19	Resistor, 10 k, 1/8 W		RN60C1002F
R20	Resistor, 10 k, 1/4 W		RC07GF103J
R21	Resistor, 47 k, 1/4 W		RC07GF473J
R22	Resistor, 10 k, 1/4 W		RC07GF103J
R23	Resistor, 47 k, 1/4 W		RC07GF473J
R24	Resistor, 10 k, 1/4 W		RC07GF103J
R25	Resistor, 36, 2 W		RC42GF360J
R26	Resistor, 100, 1/4 W		RC07GF101J
R27	Resistor, 2.49 k, 1/8 W		RN60C2491F
R28	Resistor, 36, 2 W		RC42GF360J
R29	Resistor, 100, 1/4 W		RC07GF101J
R30	Resistor, 5.49 k, 1/8 W		RN60C5491F
R31	Resistor, variable, 500		3009-P-501
R32	Resistor, variable, 10 k		3009-P-103
R33	Resistor, 47 k, 1/4 W		RC07GF473J
R34	Resistor, variable, 500		3009-P-501
R35, R36	Resistor, 20 k, 1/8 W		RN60C2002F
R37, R38	Resistor, variable, 10 k		3009-P-103
R39	Not used		
R40	Resistor, 75 k, 1/4 W		RC07GF753J
R41	Resistor, 390, 1/4 W		RC07GF391J
R42, R43	Resistor, 10 k, 1/8 W		RN60C1002F
R44	Not used		
R45	Resistor, 100, 1/2 W		RC20GF101J
R46	Resistor, variable, 10 k		3009-P-103
R47	Resistor, 1.1 k, 1/4 W		RC07GF112J

PREAMPLIFIER J4 BOARD (230480) (cont)

Item	Description	Manufacturer	Part No.
R48	Resistor, 510, 1/4 W		RC07GF511J
R49	Resistor, 3.3 k, 1/4 W		RC07GF332J
R50	Resistor, 10 k, 1/4 W		RC07GF103J
R51	Resistor, 270, 2 W		RC42GF271J
R52	Resistor, 1 k, 1/4 W		RC07GF102J
R53	Resistor, 1.2 k, 1/4 W		RC07GF122J
R54	Resistor, 100 k, 1/4 W		RC07GF104J
R55	Resistor, 10 k, 1/4 W		RC07GF103J
R56	Resistor, 1.1 k, 1/4 W		RC17GF112J
R57	Resistor, 620, 1/4 W		RC07GF621J
R58	Resistor, 100, 1/2 W		RC20GF101J
R59	Resistor, 240, 1/4 W		RC07GF241J
R60	Resistor, 1 k, 1/4 W		RC07GF102J
R61	Resistor, 10 k, 1/4 W		RC07GF103J
R62	Resistor, 1 k, 1/4 W		RC07GF102J
R63	Resistor, 1.5 k, 1/4 W		RC07GF152J
R64	Resistor, 1 k, 1/4 W		RC07GF102J
R65	Resistor, 10, 1/4 W		RC07GF100J
R66	Resistor, 2 k, 1/4 W		RC07GF202J
R67	Resistor, 1.5 k, 1/4 W		RC07GF152J
R68, R69	Resistor, 100, 1/4 W		RC07GF101J
R70	Resistor, 1 k, 1/4 W		RC07GF102J
R71	Resistor, 3.09 k, 1/8 W		RN60C3091F
R72	Resistor, 100, 1/4 W		RC07GF101J
R73, R74	Resistor, 510, 1/4 W		RC07GF511J
VR1	Transistor		2N1595
Z1 thru Z3	IC	TI	SN72741P
Z4	IC	TI	SN72710N
Z5	IC	TI	SN7400N
Z6	IC	TI	SN72741P

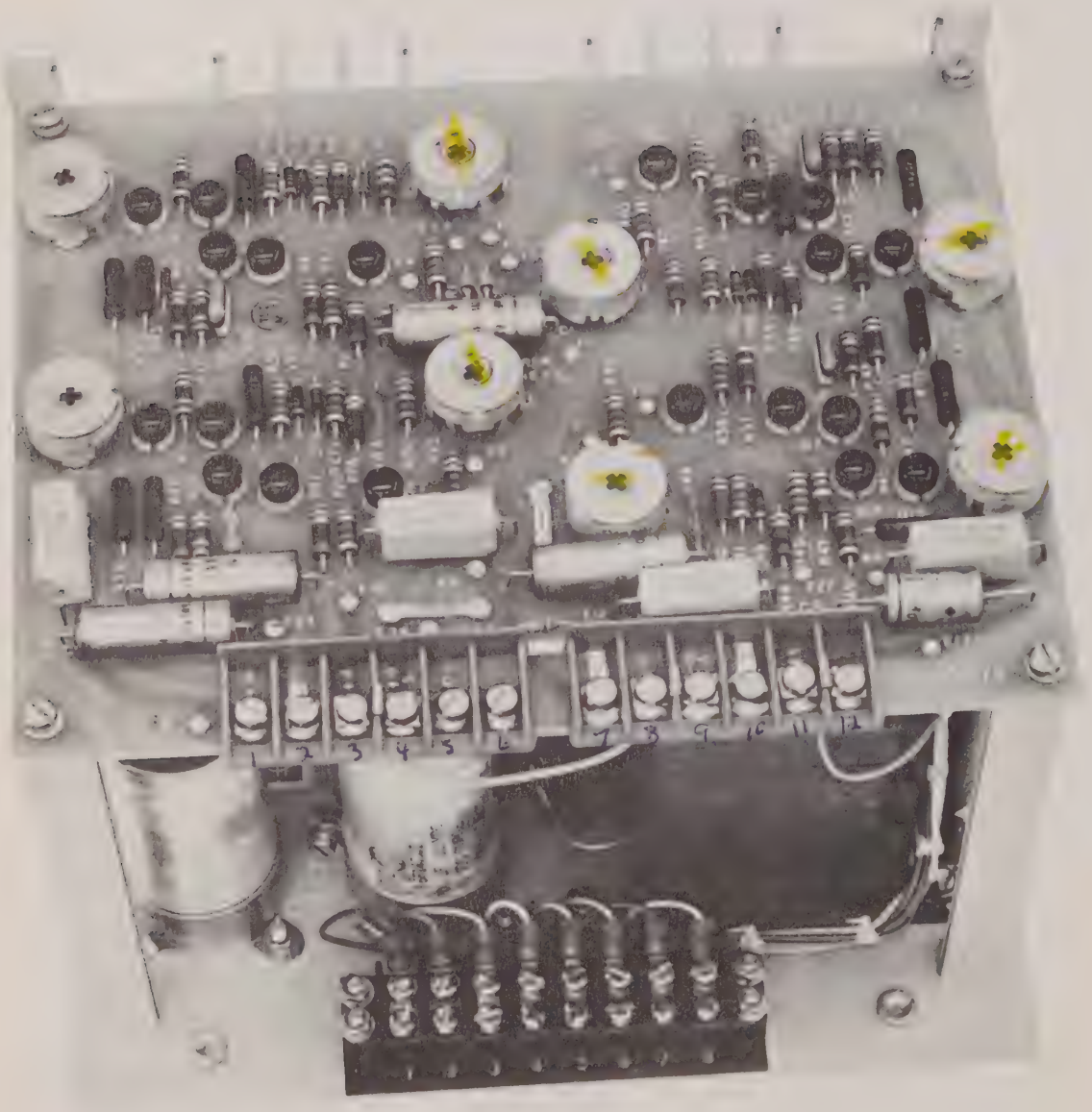


FIGURE 4-20. POWER SUPPLY (230426) (SHEET 1 OF 2)

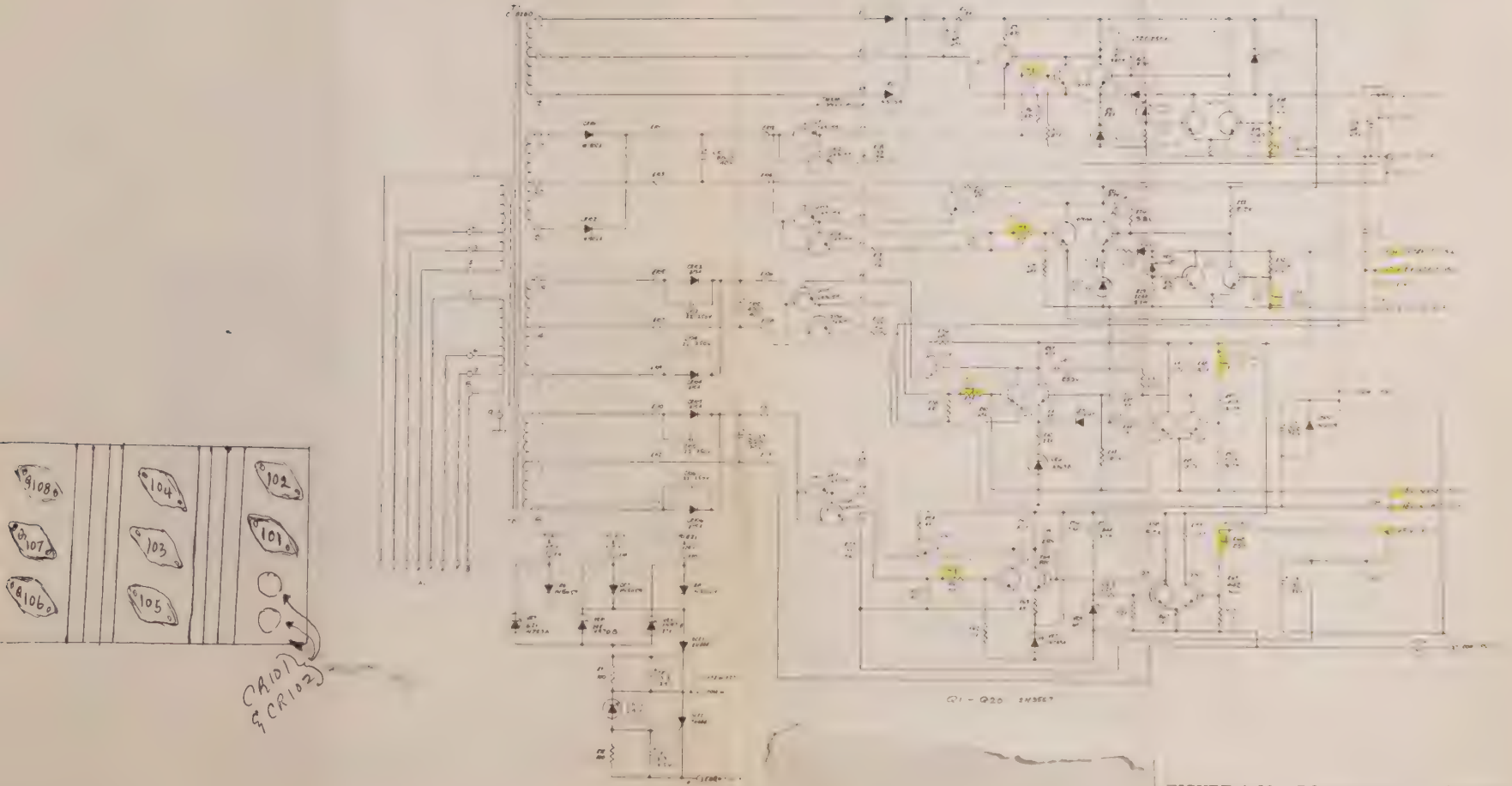


FIGURE 4-20. POWER SUPPLY (230426)

FIGURE 4-20
(SHEET 2 OF 2)

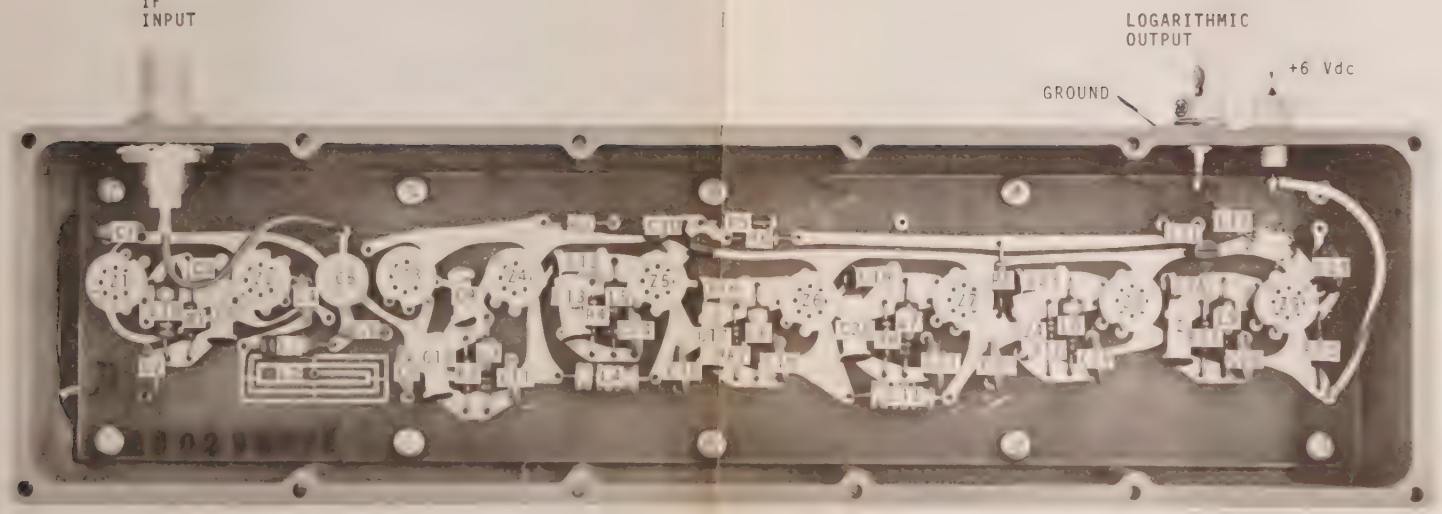


FIGURE 4-21. LOG IF AMPLIFIER (SHEET 1 OF 2)

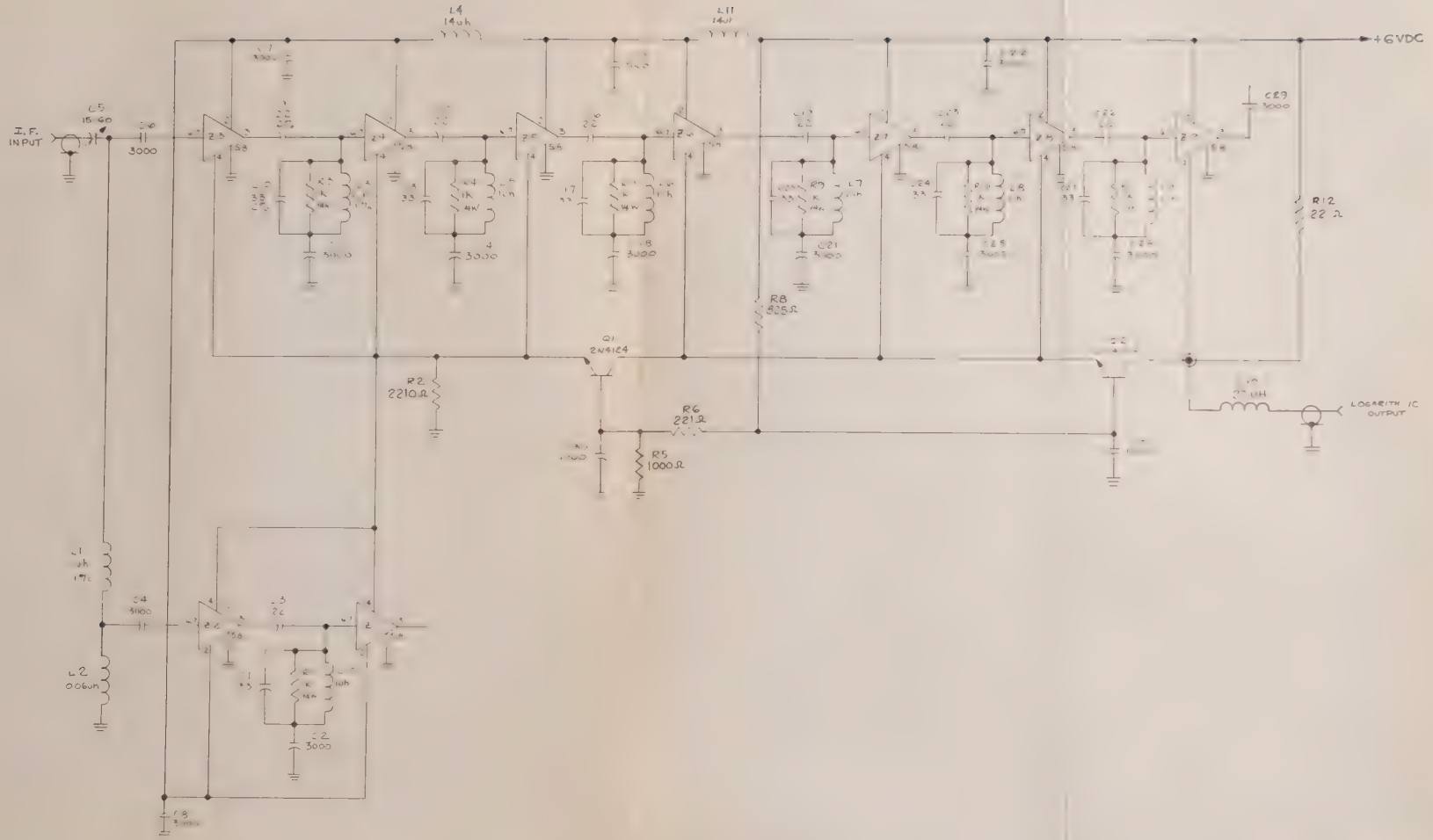


FIGURE 4-21. LOG IF AMPLIFIER

LOG IF AMPLIFIER (230294)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C2	Capacitor, 3000 pF	Centralab	DD-302
C3	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C4	Capacitor, 3000 pF	Centralab	DD-302
C5	Capacitor, Variable, 15-60 pF	Erie	538-011-F15-60
C6	Capacitor, 3000 pF	Centralab	DD-302
C7	Capacitor, 3000 pF	Centralab	DD-302
C8	Capacitor, 3000 pF	Centralab	DD-302
C9	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C10	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C11	Capacitor, 3000 pF	Centralab	DD-302
C12	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C13	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C14	Capacitor, 3000 pF	Centralab	DD-302
C15	Capacitor, 3000 pF	Centralab	DD-302
C16	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C17	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C18	Capacitor, 3000 pF	Centralab	DD-302
C19	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C20	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G

LOG IF AMPLIFIER (230294) (cont)

Item	Description	Manufacturer	Part No.
C21	Capacitor, 3000 pF	Centralab	DD-302
C22	Capacitor, 3000 pF	Centralab	DD-302
C23	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C24	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C25	Capacitor, 3000 pF	Centralab	DD-302
C26	Capacitor, 22 pF, ±2%	Erie	301-000-COGO220G
C27	Capacitor, 33 pF, ±2%	Erie	308-000-COGO330G
C28	Capacitor, 3000 pF	Centralab	DD-302
C29	Capacitor, 3000 pF	Centralab	DD-302
C30	Capacitor, 1000 pF		CK60AW102M
C31	Capacitor, 1000 pF		CK60AW102M
L1	Inductor, 1 μH, 1%	Jeffers	4425-6F
L2	Not used		
L3	Inductor, 1 μH, 1%	Jeffers	4425-6F
L4	Inductor, 14 μH	AILTECH	115297-2
L5	Inductor, 1 μH, 1%	Jeffers	4425-6F
L6	Inductor, 1 μH, 1%	Jeffers	4425-6F
L7	Inductor, 1 μH, 1%	Jeffers	4425-6F
L8	Inductor, 1 μH, 1%	Jeffers	4425-6F
L9	Inductor, 1 μH, 1%	Jeffers	4425-6F
L10	Inductor, 1 μH, 1%	Jeffers	4425-6F
L11	Inductor, 14 μH	AILTECH	115297-2
L12	Not used		

LOG IF AMPLIFIER (230294) (cont)

Item	Description	Manufacturer	Part No.
Q1	Transistor	Motorola	2N4124
Q2	Transistor	Motorola	2N4124
R1	Resistor, 1 k, 1/4 W		RC07GF102J
R2	Resistor, 2.21 k, 1/8 W		RN60C2211F
R3	Resistor, 1 k, 1/4 W		RC07GF102J
R4	Resistor, 1 k, 1/4 W		RC07GF102J
R5	Resistor, 1 k, 1/8 W		RN60C1001F
R6	Resistor, 221, 1/8 W		RN60C2210F
R7	Resistor, 1 k, 1/4 W		RC07GF102J
R8	Resistor, 825, 1/8 W		RN60C8250F
R9	Resistor, 1 k, 1/4 W		RC07GF102J
R10	Resistor, 1 k, 1/4 W		RC07GF102J
R11	Resistor, 1 k, 1/4 W		RC07GF102J
R12	Resistor, 221, 1/8 W		RN60C2210F
Z1	IC	AILTECH	230541-3
Z2	IC	AILTECH	230541-3
Z3	IC	AILTECH	230541-3
Z4	IC	AILTECH	230541-3
Z5	IC	AILTECH	230541-3
Z6	IC	AILTECH	230541-3
Z7	IC	AILTECH	230541-3
Z8	IC	AILTECH	230541-3
Z9	IC	AILTECH	230541-3

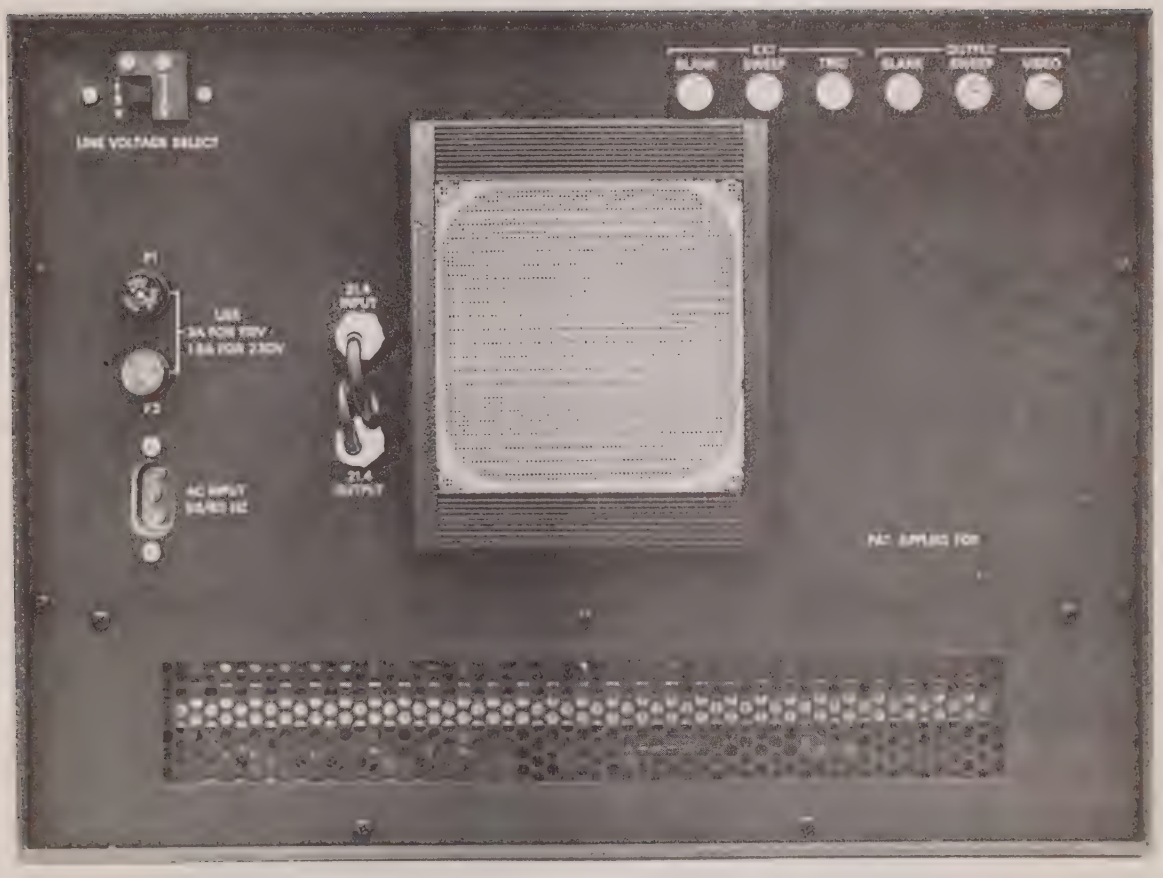


FIGURE 4-22. REAR PANEL

SECTION IV. DISPLAY UNIT

This section presents parts location, schematic diagrams, and lists of replaceable parts for the display unit (Figure 4-23).

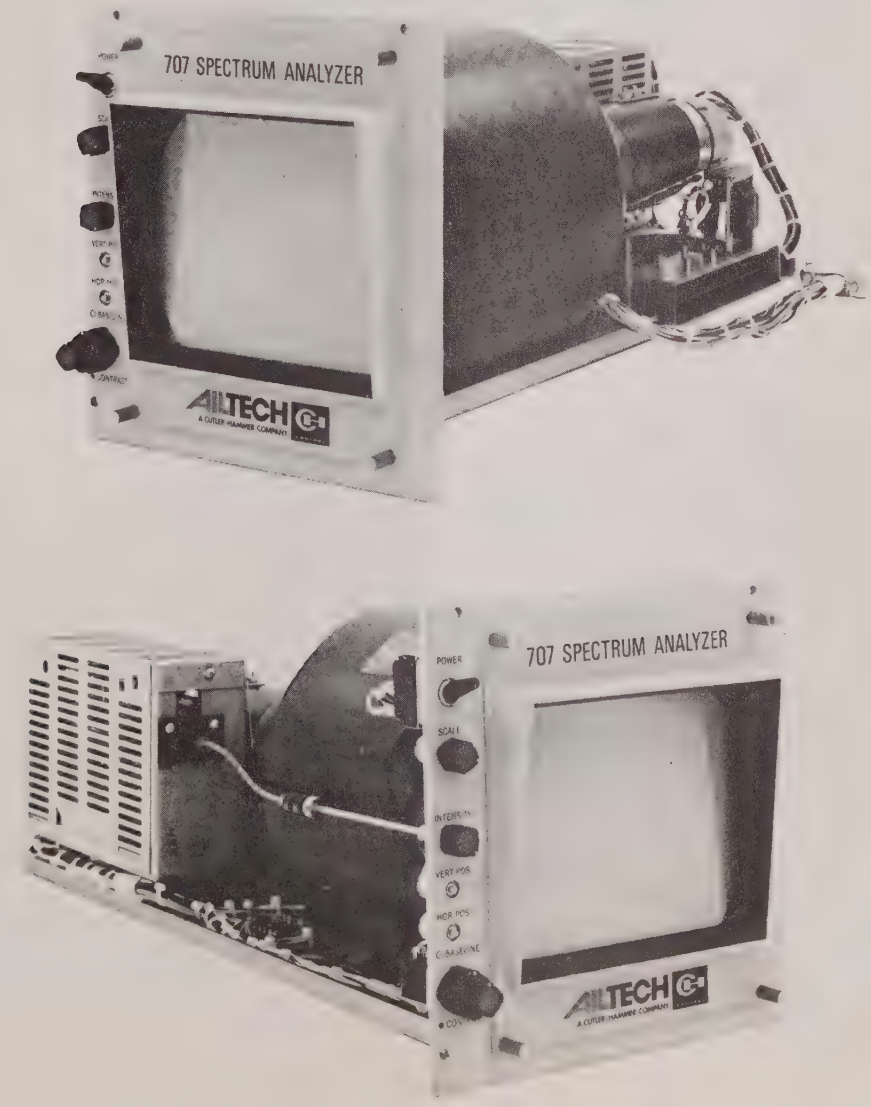


FIGURE 4-23. DISPLAY UNIT

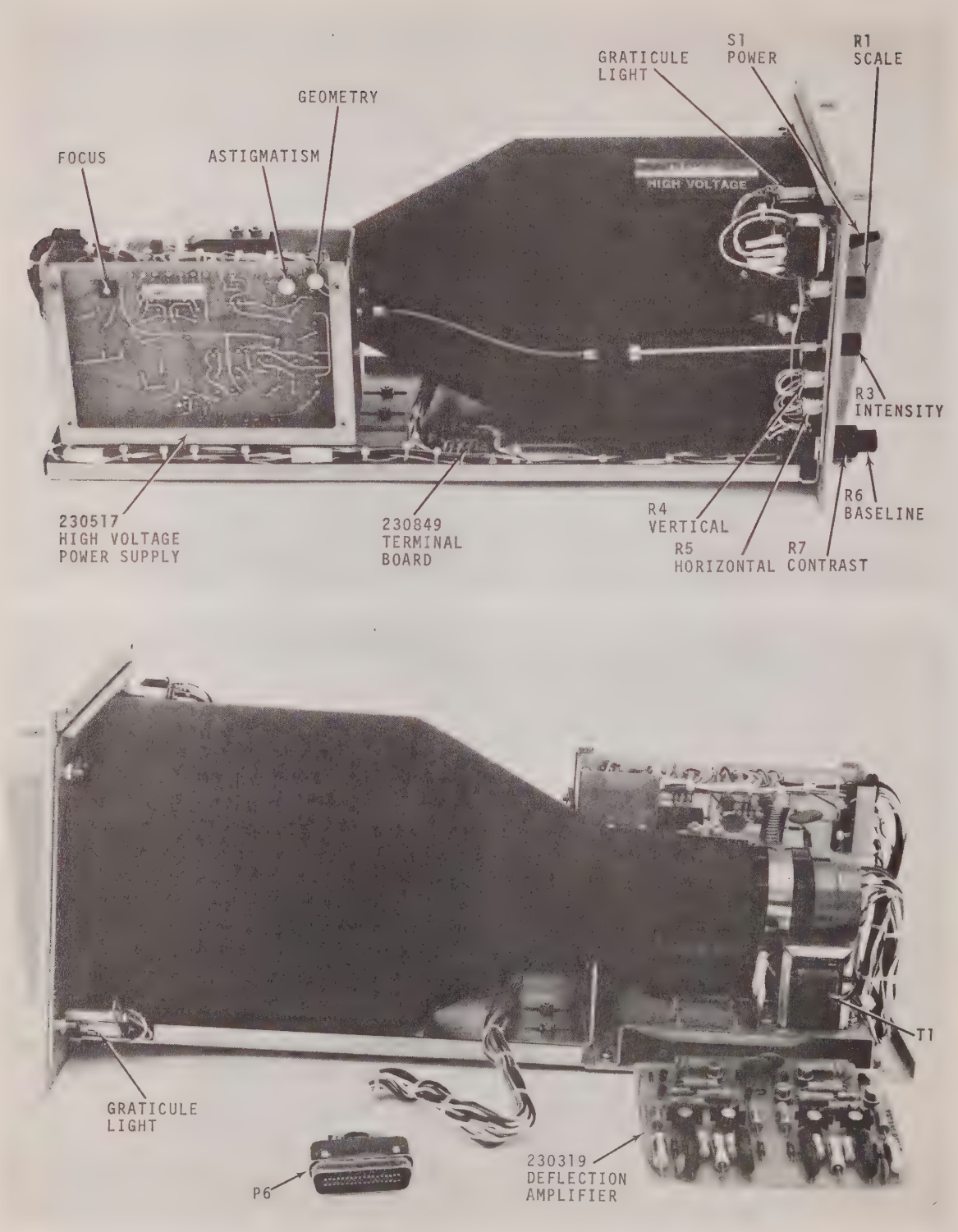


FIGURE 4-24. DISPLAY UNIT, OPEN VIEW (SHEET 1 OF 2)

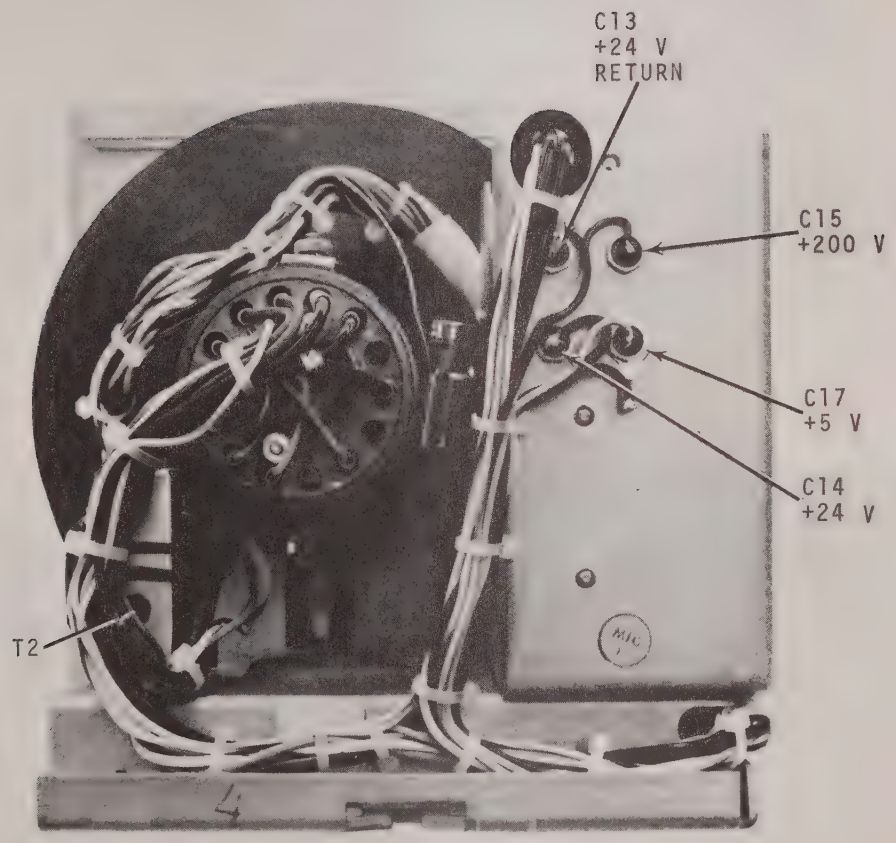


FIGURE 4-24. DISPLAY UNIT, OPEN VIEW (SHEET 2 OF 2)

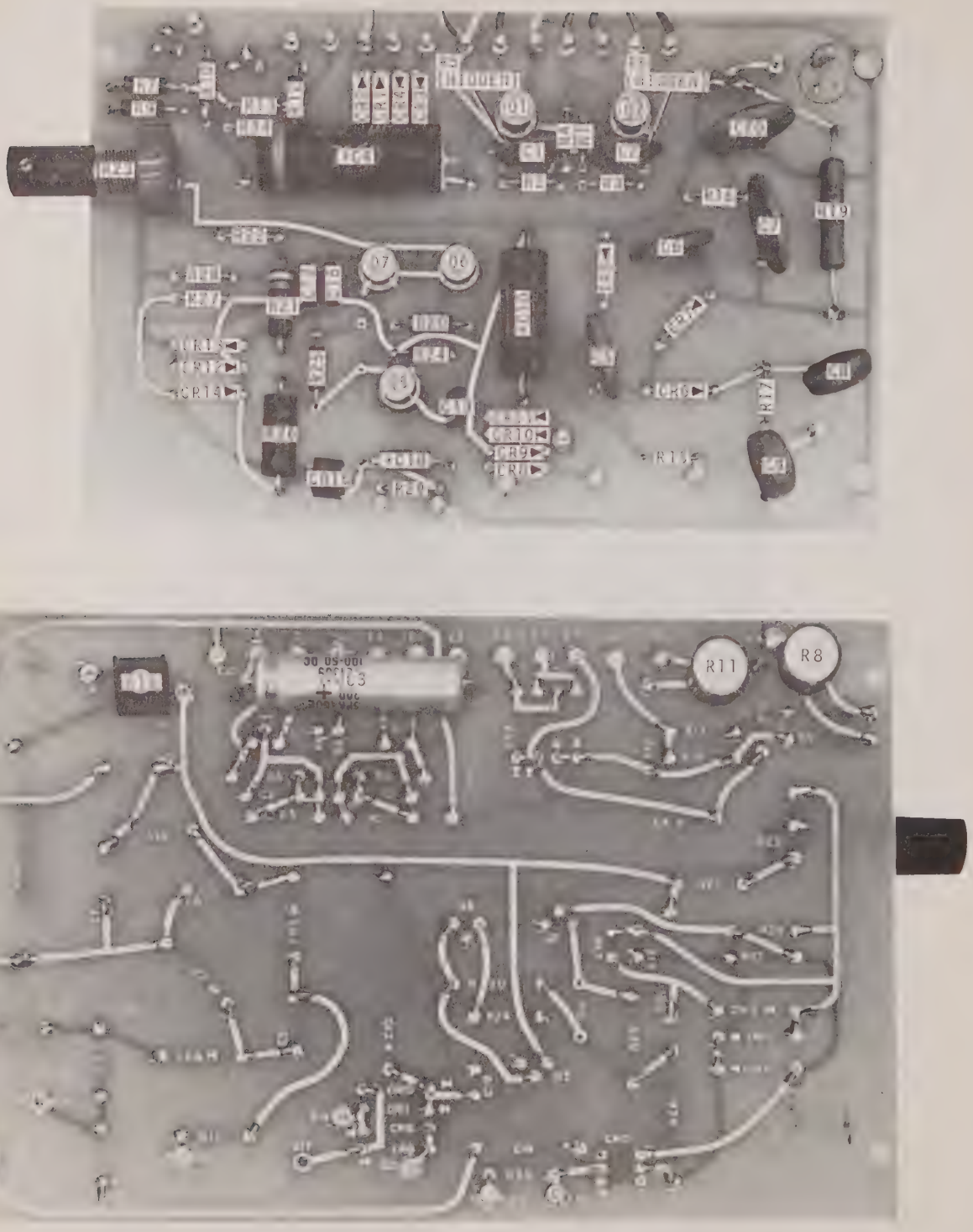


FIGURE 4-25. HIGH VOLTAGE POWER SUPPLY (230517) (SHEET 1 OF 2)

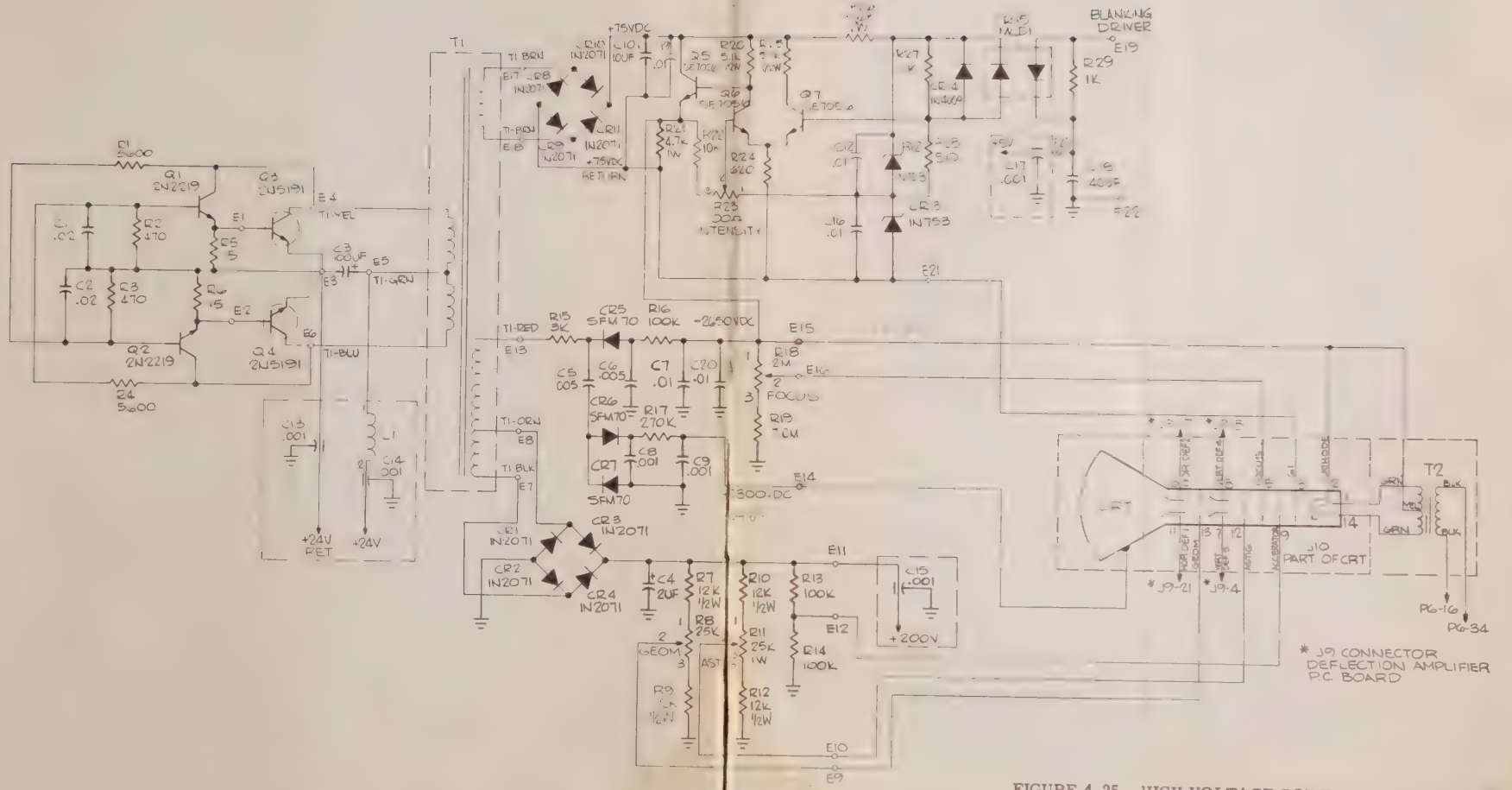


FIGURE 4-25. HIGH VOLTAGE POWER SUPPLY (230517)

HIGH VOLTAGE POWER SUPPLY (230517)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 0.02 μF	Centralab	DD-203
C2	Capacitor, 0.02 μF	Centralab	DD-203
C3	Capacitor, 100 μF	Sprague	TE-1309
C4	Capacitor, 2 μF, 200 V	Aerovox	P82922N14
C5	Capacitor, 0.005, 3 kV	Centralab	DD30-502
C6	Capacitor, 0.005, 3 kV	Centralab	DD30-502
C7	Capacitor, 0.01, 3 kV	Sprague	306A-S10
C8	Capacitor, 1000 pF, 6 kV	Centralab	DD60-102
C9	Capacitor, 1000 pF, 6 kV	Centralab	DD60-102
C10	Capacitor, 10 μF, 150 V	Cornell-Dubilier	BR10-150
C11	Not used		
C12	Capacitor, 0.01 μF, 200 V		CK06CW103K
C13	Not used		
C14	Not used		
C15	Not used		
C16	Capacitor, 0.01 μF, 200 V		CK06CW103K
C17	Not used		
C18	Capacitor, 40 μF, 10 V	Sprague	150D406X0010B2
C19	Capacitor, 0.01 μF, 200 V		CK06CW103K
C20	Capacitor, 0.01 μF, 3 kV	Sprague	306A-S10
CR1	Diode		1N2071
CR2	Diode		1N2071
CR3	Diode		1N2071
CR4	Diode		1N2071
CR5	Diode	Semteck	SFM70

Item	Description	Manufacturer	Part No.
CR6	Diode	Semteck	SFM70
CR7	Diode	Semteck	SFM70
CR8	Diode		1N2071
CR9	Diode		1N2071
CR10	Diode		1N2071
CR11	Diode		1N2071
CR12	Diode		1N753A
CR13	Diode		1N753A
CR14	Diode		1N4009
CR15	PC diode	Litronics	1L1
Q1	Transistor		2N2219
Q2	Transistor		
Q3	Not used		
Q4	Not used		
Q5	Transistor	Fairchild	SE7056
Q6	Transistor	Fairchild	SE7056
Q7	Transistor	Fairchild	SE7056
R1	Resistor, 5.6 k, 1/4 W		RC07GF562J
R2	Resistor, 470, 1/4 W		RC07GF471J
R3	Resistor, 470, 1/4 W		RC07GF471J
R4	Resistor, 5.6 k, 1/4 W		RC07GF562J
R5	Resistor, 15, 1/4 W		RC07GF150J
R6	Resistor, 15, 1/4 W		RC07GF150J
R7	Resistor, 12 k, 1/2 W		RC20GF123J
R8	Resistor, variable, 25 k, 1 W	Bourns	3345P-1-253

HIGH VOLTAGE POWER SUPPLY (230517) (cont)

Item	Description	Manufacturer	Part No.
R9	Resistor, 12 k, 1/2 W		RC20GF123J
R10	Resistor, 12 k, 1/2 W		RC20GF123J
R11	Resistor, variable, 25 k, 1 W	Bourns	3345P-1-253
R12	Resistor, 12 k, 1/2 W		RC20GF123J
R13	Resistor, 100 k, 1/4 W		RC07GF104J
R14	Resistor, 100 k, 1/4 W		RC07GF104J
R15	Resistor, 3 k, 1/4 W		RC07GF302J
R16	Resistor, 100 k, 1/4 W		RC07GF104J
R17	Resistor, 270 k, 1/4 W		RC07GF274J
R18	Resistor, variable, 2 meg, 1/2 W	Bourns	3389P-1-205
R19	Resistor, 7.0 meg, 2 W, ±5%	Coddack	MG721
R20	Resistor, 5.1 k, 1/2 W		RC20GF512J
R21	Resistor, 4.7 k, 1 W		RC32GF472J
R22	Resistor, 10 k, 1/4 W		RC07GF103J
R23	Resistor, variable, modified, 100, 2 W	AILTECH	230894
R24	Resistor, 620, 1/4 W		RC07GF621J
R25	Resistor, 5.1 k, 1/2 W		RC20GF512J
R26	Resistor, 5.6 k, 2 W		RC42GF562J
R27	Resistor, 11 k, 1/4 W		RC07GF113J
R28	Resistor, 510, 1/4 W		RC07GF511J
R29	Resistor, 1 k, 1/4 W		RC07GF102J

Item	Description	Manufacturer	Part No.
R1	Resistor, variable, 250	Bourns	3862C-281-251A
R2, R3	Not used		
R4	Resistor, variable, 1 k	Bourns	3862C-122-102A
R5	Resistor, variable, 1 k	Bourns	3862C-122-102A
R6	Resistor, variable, concentric, 1 k	Allen-Bradley	10M015
R7	Resistor, variable (inner), 10 k	Allen-Bradley	(part of 10M015)
R8 thru R15	Not used		
R16	Resistor, 750, 1/8 W		RC07GF511J
R17	Resistor, 2 k, 1/4 W		RC07GF202J
R18	Resistor, 4.75 k, 1/8 W		RN60C4751F
R19	Resistor, 27 k, 1/8 W		RN50C2702F
R20	Resistor, 4.75 k, 1/8 W		RN50C4751F
R21	Resistor, 1.5 k, 1/4 W		RC07GF152J
S1	Switch	Cutler-Hammer	7590K54-F27

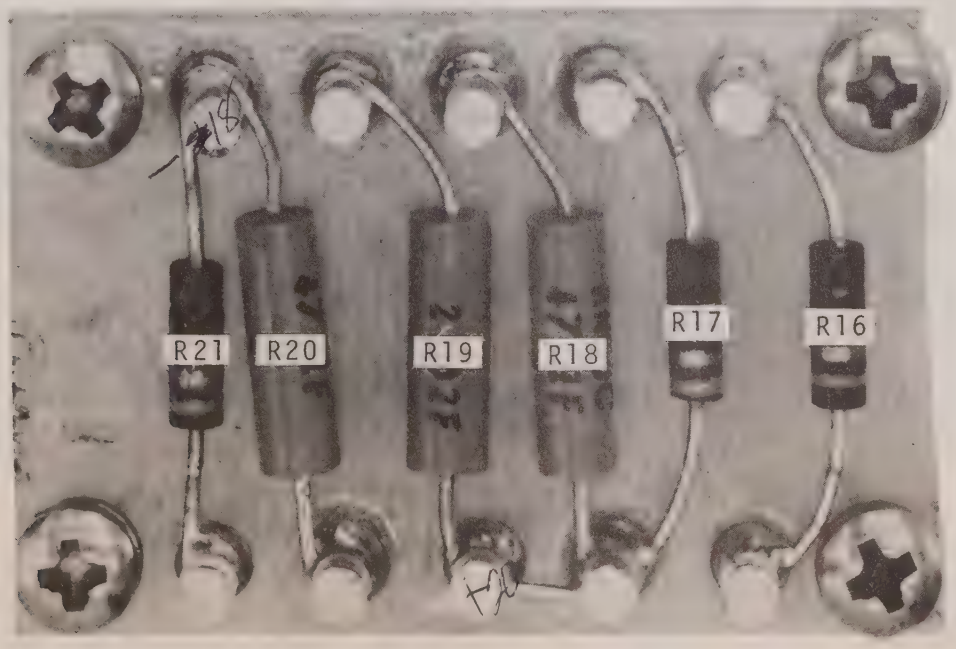


FIGURE 4-26. TERMINAL BOARD

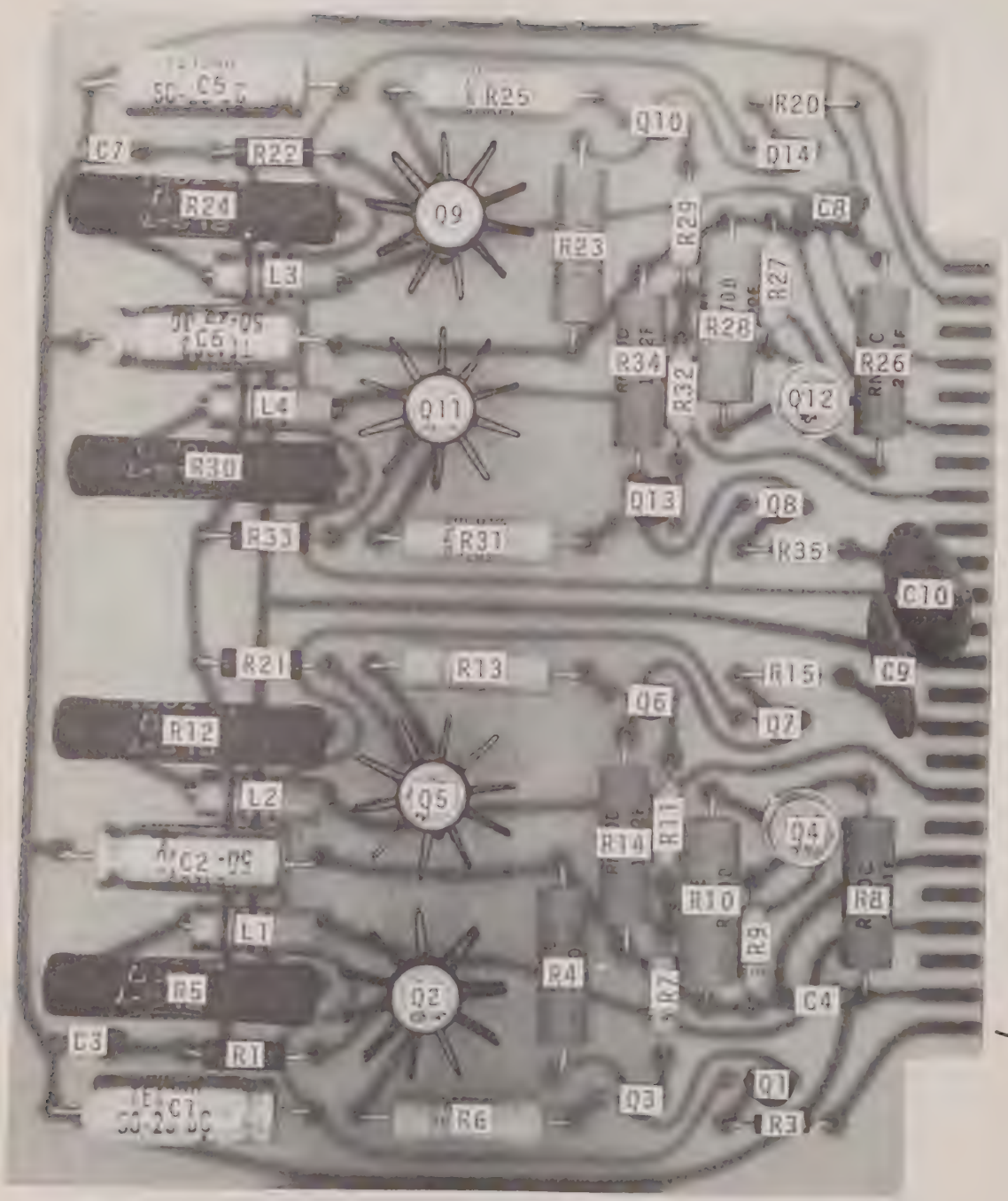


FIGURE 4-27. DEFLECTION AMPLIFIER (230319) (SHEET 1 OF 2)

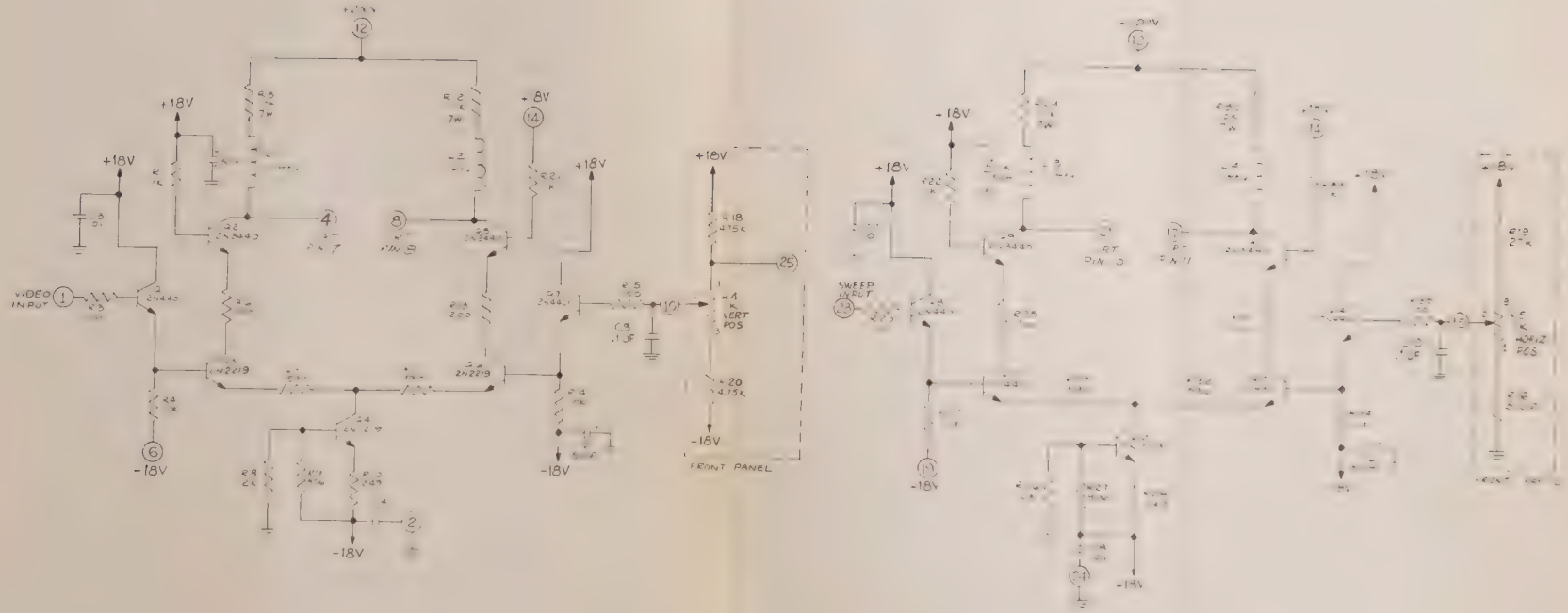


FIGURE 4-27. DEFLECTION AMPLIFIER (230319)

DEFLECTION AMPLIFIER (230319)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 50 μF	Sprague	TE-1209
C2	Capacitor, 50 μF	Sprague	TE-1209
C3	Capacitor, 0.01 μF	Sprague	5HKS-S10
C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Capacitor, 50 μF	Sprague	TE-1209
C6	Capacitor, 50 μF	Sprague	TE-1209
C7	Capacitor, 0.01 μF	Sprague	5HKS-S10
C8	Capacitor, 0.01 μF	Sprague	5HKS-S10
C9, C10	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
L1	Inductor, 1.1 mH	Delevan	2500-30
L2	Inductor, 1.1 mH	Delevan	2500-30
L3	Inductor, 1.1 mH	Delevan	2500-30
L4	Inductor, 1.1 mH	Delevan	2500-30
Q1	Transistor		2N4401
Q2	Transistor		2N3440
Q3	Transistor		2N2219
Q4	Transistor		2N2219
Q5	Transistor		2N3440
Q6	Transistor		2N2219
Q7	Transistor		2N4401
Q8	Transistor		2N4401
Q9	Transistor		2N3440
Q10	Transistor		2N4401
Q11	Transistor		2N3440
Q12	Transistor		2N2219
Q13	Transistor		2N4401
Q14	Transistor		2N4401

DEFLECTION AMPLIFIER (230319) (cont)

Item	Description	Manufacturer	Part No.
R1	Resistor, 1 k, 1/2 W		RC20GF102J
R2	Not used		
R3	Resistor, 100, 1/4 W		RC07GF101J
R4	Resistor, 10 k, 1/2 W		RN70D1002F
R5	Resistor, 10 k, 1%, 7 W	Dale	RLS-7
R6	Resistor, 200, 1/2 W		RN70D2000F
R7	Resistor, 59, 1/8 W		RN50C59R0F
R8	Resistor, 2 k, 1/2 W		RN70D2001F
R9	Resistor, 806, 1/8 W		RN60C8060F
F10	Resistor, 249, 1/2 W		RN70D2490F
R11	Resistor, 59, 1/8 W		RN60C59R0F
R12	Resistor, 10 k, 1%, 7 W	Dale	RLS-7
R13	Resistor, 200, 1/2 W		RN70D2000F
R14	Resistor, 10 k, 1/2 W		RN70D1002F
R15	Resistor, 100, 1/4 W		RC07GF101J
R16	Not used		
R17	Not used		
R18	Not used		
R19	Not used		
R20	Resistor, 100, 1/4 W		RC07GF101J
R21	Resistor, 1 k, 1/2 W		RC20GF102J
R22	Resistor, 1 k, 1/2 W		RC20GF102J
R23	Resistor, 10 k, 1/2 W		RN70D1002F
R24	Resistor, 10 k, 1%, 7 W	Dale	RLS-7
R25	Resistor, 200, 1/2 W		RN70D2000F
R26	Resistor, 2 k, 1/2 W		RN70D2001F
R27	Resistor, 806, 1/8 W		RN50C8060F

Item	Description	Manufacturer	Part No.
R28	Resistor, 249, 1/2 W		RN70D2490F
R29	Resistor, 59, 1/8 W		RN60C59R0F
R30	Resistor, 10 k, 1%, 7 W	Dale	RLS-7
R31	Resistor, 200, 1/2 W		RN70D2000F
R32	Resistor, 59, 1/8 W		RN60C59R0F
R33	Resistor, 1 k, 1/2 W		RC20GF102J
R34	Resistor, 10 k, 1/2 W		RN70D1002F
R35	Resistor, 100, 1/4 W		RC07GF101J

SECTION V. RF ASSEMBLY

This section presents parts location, schematic diagrams, and lists of replaceable parts for the units of the RF assembly (Figure 4-28).

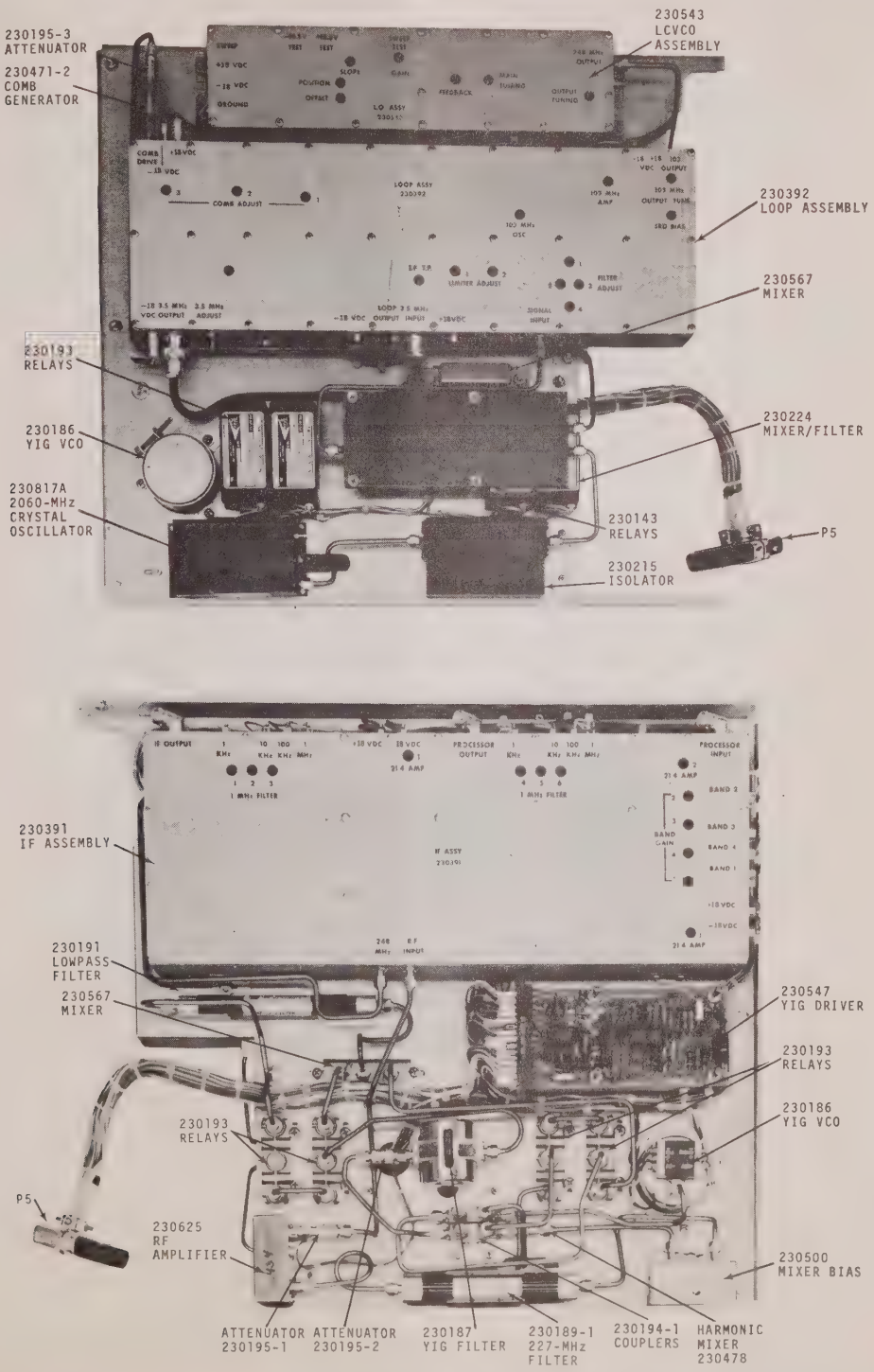


FIGURE 4-28. RF ASSEMBLY

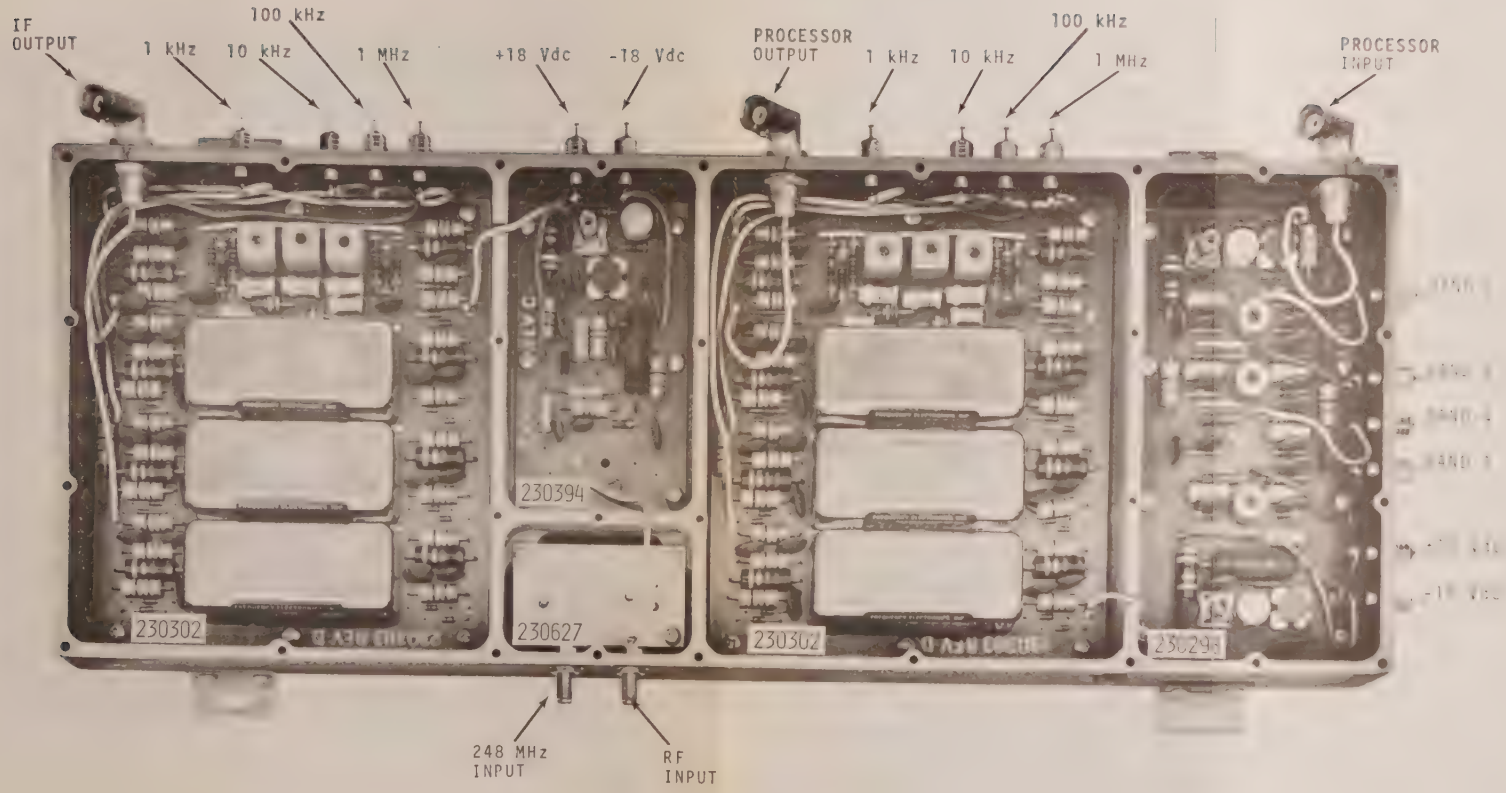


FIGURE 4-29. IF ASSEMBLY (230391)

FIGURE 4-29

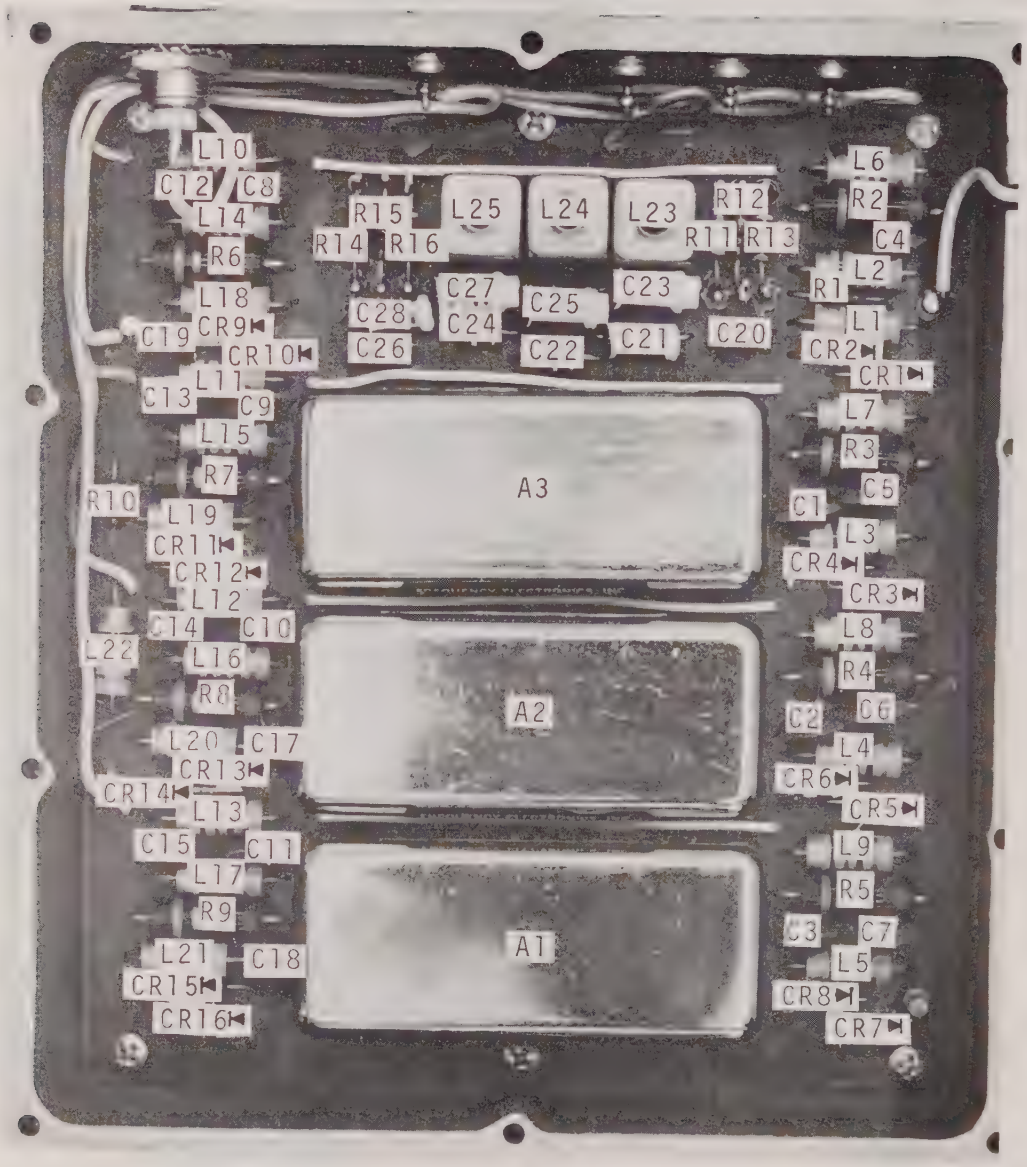


FIGURE 4-30. IF FILTER (230302) (SHEET 1 OF 2)

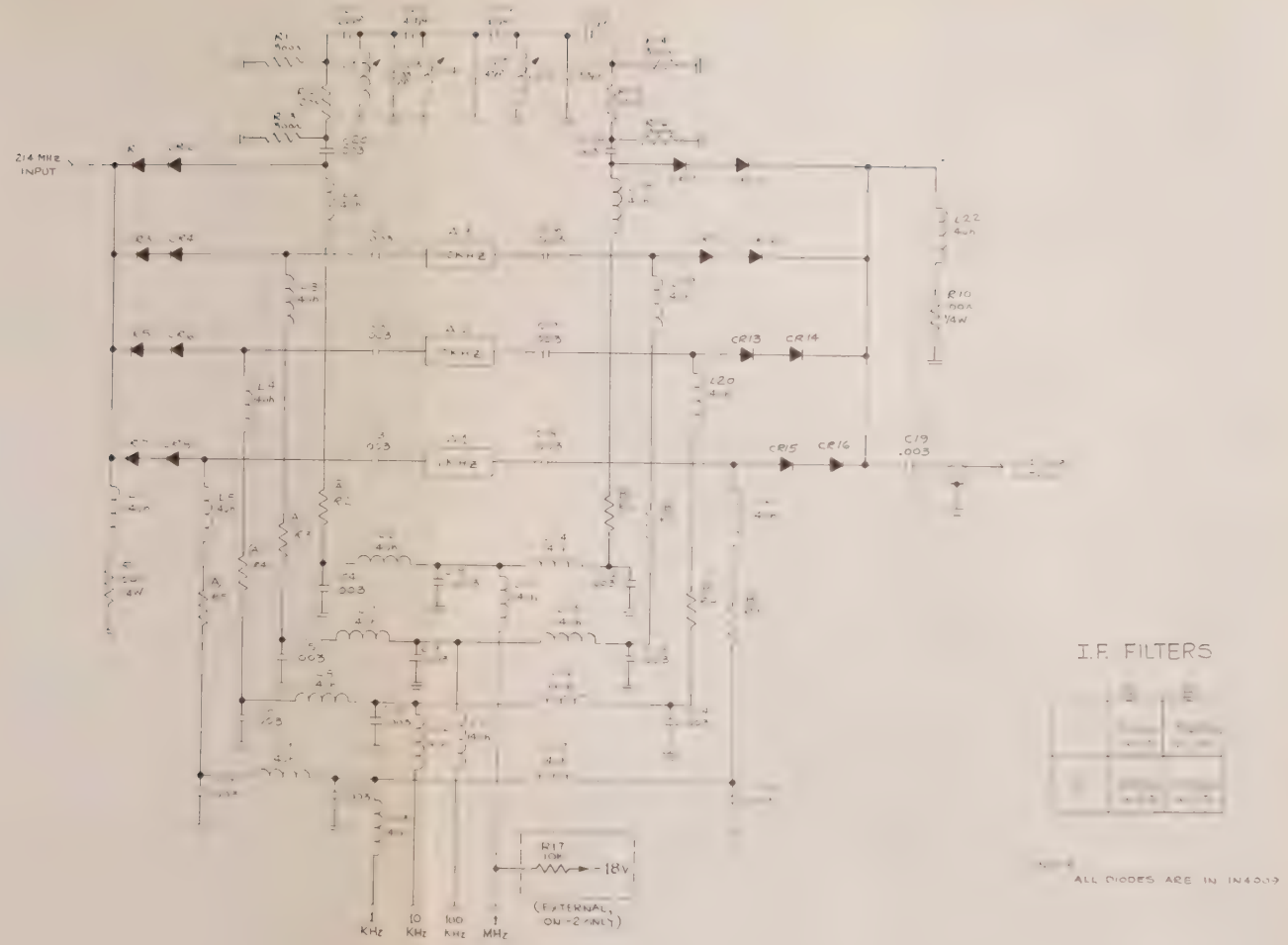
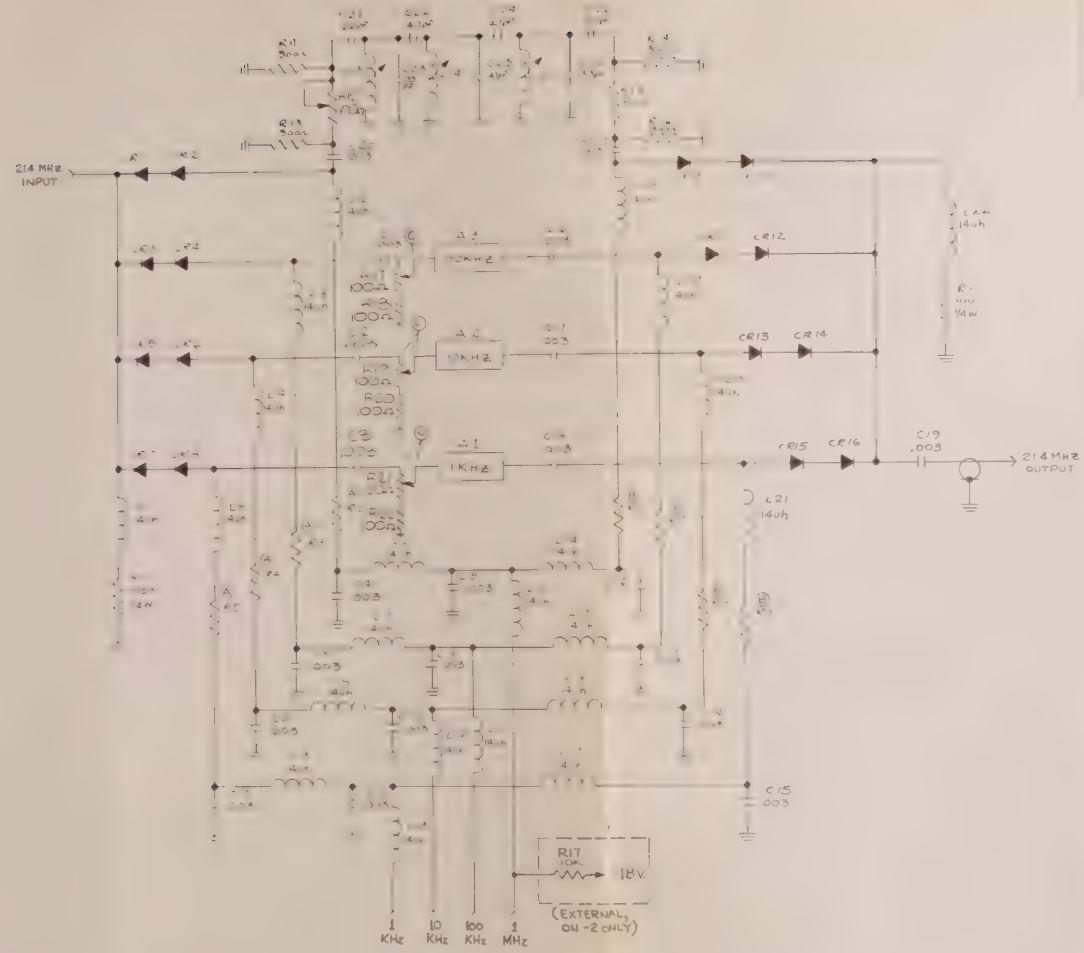


FIGURE 4-30. IF FILTER (230302) (SERIAL NOS. 1-549)



I.F. FILTERS

	Ⓐ	Ⓑ	Ⓒ
-1	200Ω 1W, 5%	560Ω 1W, 5%	ADD WIRE JUMPER - DONOT INSTALL R17 THRU R22
-2	1000Ω 1W, 5%	1000Ω 1W 5%	INSTALL R17 THRU R22

ALL DIODES ARE IN 4.009

FIGURE 4-30. IF FILTER (230302) (SERIAL NOS. 550 AND UP)

IF FILTER (230302)

Item	Description	Manufacturer	Part No.
A1(-1)	Crystal filter	AILTECH	230192-1
A2(-2)	Crystal filter	AILTECH	230192-2
A3(-3)	Crystal filter	AILTECH	230192-3
C1	Capacitor, 3000 pF	Centralab	DD-302
C2	Capacitor, 3000 pF	Centralab	DD-302
C3	Capacitor, 3000 pF	Centralab	DD-302
C4	Capacitor, 3000 pF	Centralab	DD-302
C5	Capacitor, 3000 pF	Centralab	DD-302
C6	Capacitor, 3000 pF	Centralab	DD-302
C7	Capacitor, 3000 pF	Centralab	DD-302
C8	Capacitor, 3000 pF	Centralab	DD-302
C9	Capacitor, 3000 pF	Centralab	DD-302
C10	Capacitor, 3000 pF	Centralab	DD-302
C11	Capacitor, 3000 pF	Centralab	DD-302
C12	Capacitor, 3000 pF	Centralab	DD-302
C13	Capacitor, 3000 pF	Centralab	DD-302
C14	Capacitor, 3000 pF	Centralab	DD-302
C15	Capacitor, 3000 pF	Centralab	DD-302
C16	Capacitor, 3000 pF	Centralab	DD-302
C17	Capacitor, 3000 pF	Centralab	DD-302
C18	Capacitor, 3000 pF	Centralab	DD-302
C19	Capacitor, 3000 pF	Centralab	DD-302
C20	Capacitor, 3000 pF	Centralab	DD-302
C21	Capacitor, 22 pF	Erie	301-000-COGO-220G
C22	Capacitor, 4.7 pF	Stackpole	Stackpole GA
C23	Capacitor, 33 pF	Erie	308-000-COGO-330G

IF FILTER (230302) (cont)

Item	Description	Manufacturer	Part No.
C24	Capacitor, 4.7 pF	Stackpole	Stackpole GA
C25	Capacitor, 47 pF	Erie	308-000-COGO-470G
C26	Capacitor, 22 pF	Erie	301-000-COGO-220G
C27	Capacitor, 33 pF	Erie	308-000-COGO-330G
C28	Capacitor, 3000 pF	Centralab	DD-302
CR1	Diode		1N4009
CR2	Diode		1N4009
CR3	Diode		1N4009
CR4	Diode		1N4009
CR5	Diode		1N4009
CR6	Diode		1N4009
CR7	Diode		1N4009
CR8	Diode		1N4009
CR9	Diode		1N4009
CR10	Diode		1N4009
CR11	Diode		1N4009
CR12	Diode		1N4009
CR13	Diode		1N4009
CR14	Diode		1N4009
CR15	Diode		1N4009
CR16	Diode		1N4009
L1	Inductor, 14 μH	AILTECH	115297-2
L2	Inductor, 14 μH	AILTECH	115297-2
L3	Inductor, 14 μH	AILTECH	115297-2
L4	Inductor, 14 μH	AILTECH	115297-2

Item	Description	Manufacturer	Part No.
L5	Inductor, 14 μH	AILTECH	115297-2
L6	Inductor, 14 μH	AILTECH	115297-2
L7	Inductor, 14 μH	AILTECH	115297-2
L8	Inductor, 14 μH	AILTECH	115297-2
L9	Inductor, 14 μH	AILTECH	115297-2
L10	Inductor, 14 μH	AILTECH	115297-2
L11	Inductor, 14 μH	AILTECH	115297-2
L12	Inductor, 14 μH	AILTECH	115297-2
L13	Inductor, 14 μH	AILTECH	115297-2
L14	Inductor, 14 μH	AILTECH	115297-2
L15	Inductor, 14 μH	AILTECH	115297-2
L16	Inductor, 14 μH	AILTECH	115297-2
L17	Inductor, 14 μH	AILTECH	115297-2
L18	Inductor, 14 μH	AILTECH	115297-2
L19	Inductor, 14 μH	AILTECH	115297-2
L20	Inductor, 14 μH	AILTECH	115297-2
L21	Inductor, 14 μH	AILTECH	115297-2
L22	Inductor, 14 μH	AILTECH	115297-2
L23	Inductor, variable	Caddel-Burns	118244-4
L24	Inductor, variable	Caddel-Burns	118244-4
L25	Inductor, variable	Caddel-Burns	118244-4
R1	Resistor, 100, 1/4 W		RC07GF101J
R2(-1)	Resistor, 200, 1 W, 5%		RC32GF201J
R3(-1)	Resistor, 200, 1 W, 5%		RC32GF201J
R4(-1)	Resistor, 200, 1 W, 5%		RC32GF201J
R5(-1)	Resistor, 200, 1 W, 5%		RC32GF201J
R6(-1)	Resistor, 560, 1 W, 5%		RC32GF561J

IF FILTER (230302) (cont)

Item	Description	Manufacturer	Part No.
R7(-1)	Resistor, 560, 1 W, 5%		RC32GF561J
R8(-1)	Resistor, 560, 1 W, 5%		RC32GF561J
R9(-1)	Resistor, 560, 1 W, 5%		RC32GF561J
R2(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R3(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R4(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R5(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R6(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R7(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R8(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R9(-2)	Resistor, 1 k, 1 W, 5%		RC32GF102J
R10	Resistor, 100, 1/4 W		RC07GF101J
R11	Resistor, 300, 1/4 W		RC07GF301J
R12	Resistor, variable, 100	Bourns	3339P-1-101
R13	Resistor, 300, 1/4 W		RC07GF301J
R14	Resistor, 300, 1/4 W		RC07GF301J
R15	Resistor, 20, 1/4 W		RC07GF200J
R16	Resistor, 300, 1/4 W		RC07GF301J
R17(-2)	Resistor, variable, 100	Bourns	3339P-1-101
R18(-2)	Resistor, 100, 1/4 W		RC07GF101J
R19(-2)	Resistor, variable, 100	Bourns	3339P-1-101
R20(-2)	Resistor, 100, 1/4 W		RC07GF101J
R21(-2)	Resistor, variable, 100	Bourns	3339P-1-101
R22(-2)	Resistor, 100, 1/4 W		RC07GF101J

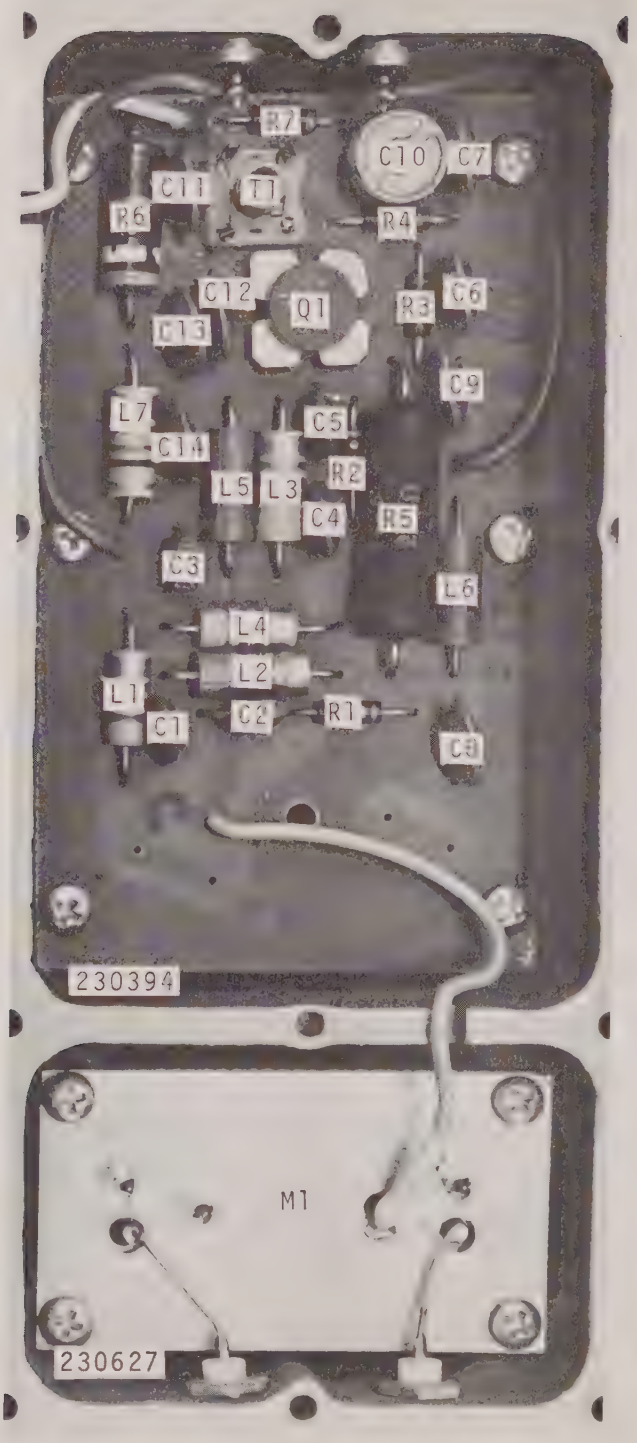


FIGURE 4-31. IF AMPLIFIER MIXER (230394) (SHEET 1 OF 2)

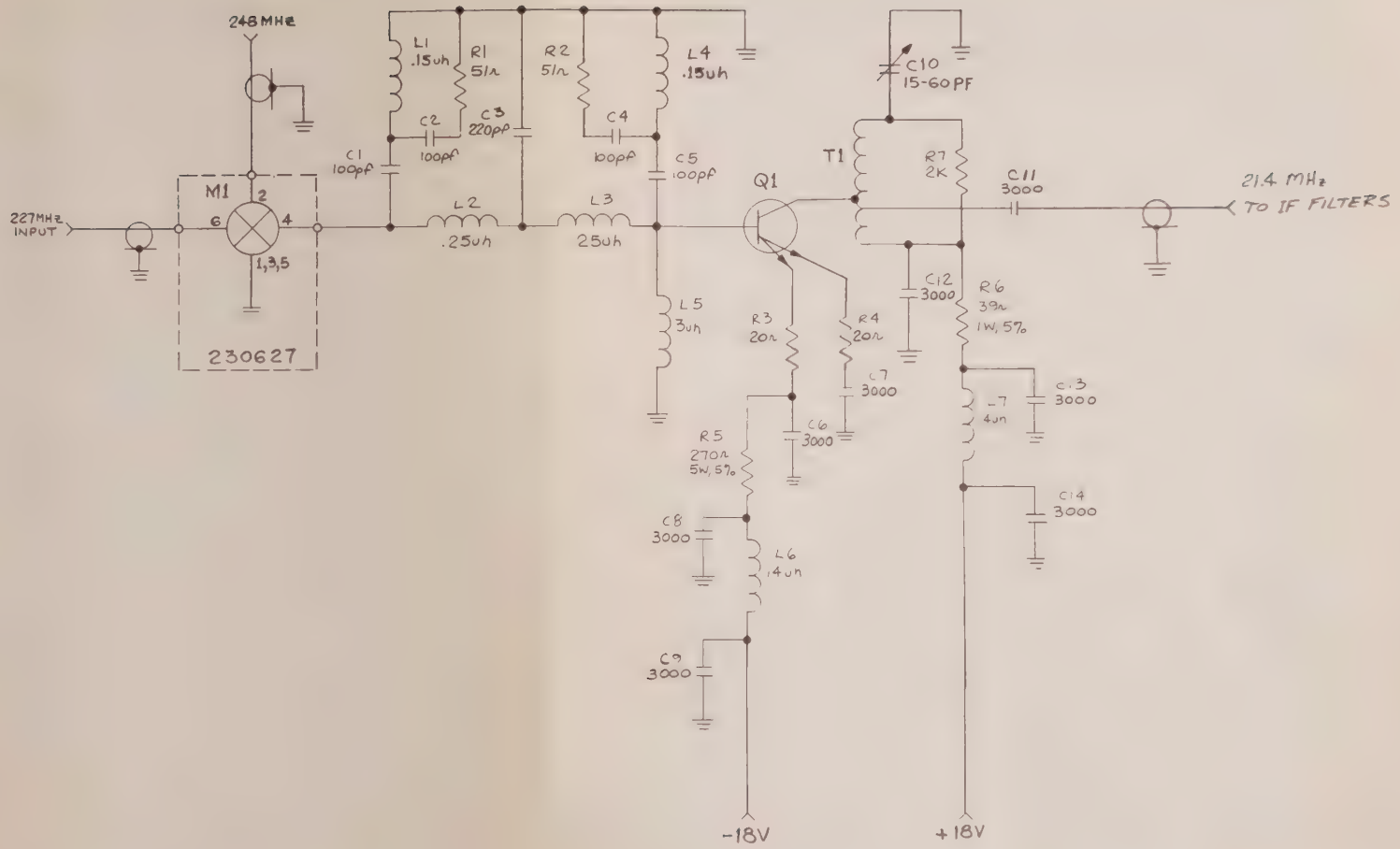


FIGURE 4-31. IF AMPLIFIER MIXER (230394)

IF AMPLIFIER MIXER (230394)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 100 pF	Centralab	DD-101
C2	Capacitor, 100 pF	Centralab	DD-101
C3	Capacitor, 220 pF	Centralab	CK05CW221K
C4	Capacitor, 100 pF	Centralab	DD-101
C5	Capacitor, 100 pF	Centralab	DD-101
C6	Capacitor, 0.003 μF	Centralab	DD-302
C7	Capacitor, 0.003 μF	Centralab	DD-302
C8	Capacitor, 0.003 μF	Centralab	DD-302
C9	Capacitor, 0.003 μF	Centralab	DD-302
C10	Capacitor, variable 15-60 pF		538-011-F-15-60
C11	Capacitor, 0.003 μF	Centralab	DD-302
C12	Capacitor, 0.003 μF	Centralab	DD-302
C13	Capacitor, 0.003 μF	Centralab	DD-302
C14	Capacitor, 0.003 μF	Centralab	DD-302
L1	Inductor, 0.15 μH	Delevon	1537-00
L2	Inductor, 0.25 μH	Jeffers	115297-1
L3	Inductor, 0.25 μH	Jeffers	115297-1
L4	Inductor, 0.15 μH	Delevon	1537-00
L5	Inductor, 3 μH	Jeffers	115297-4
L6	Inductor, 14 μH	Jeffers	115297-2
L7	Inductor, 14 μH	Jeffers	115297-2
Q1	Transistor	AILTECH	230541-1
R1	Resistor, 51, 1/4 W		RC07GF510J
R2	Resistor, 51, 1/4 W		RC07GF510J
R3	Resistor, 20, 1/4 W		RC07GF200J
R4	Resistor, 20, 1/4 W		RC07GF200J

Item	Description	Manufacturer	Part No.
R5	Resistor, 270, 5 W, 5%	Dale	RS-5, 270, 5%
R6	Resistor, 39, 1 W		RC32GF390J
R7	Resistor, 2 k, 1/4 W		RC07GF202J
T1	Inductor, variable	AILTECH	230510

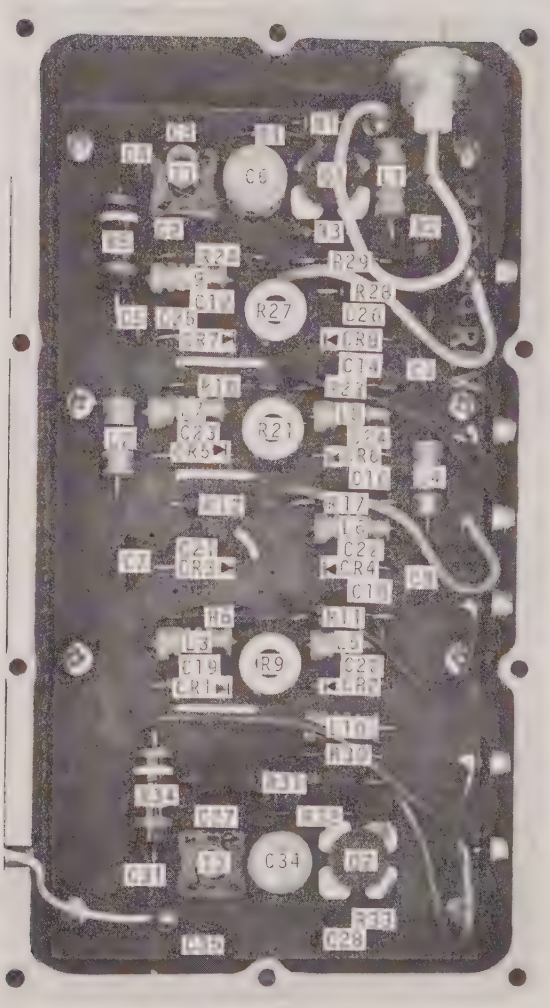


FIGURE 4-32. IF PROCESSOR (230298) (SHEET 1 OF 2)

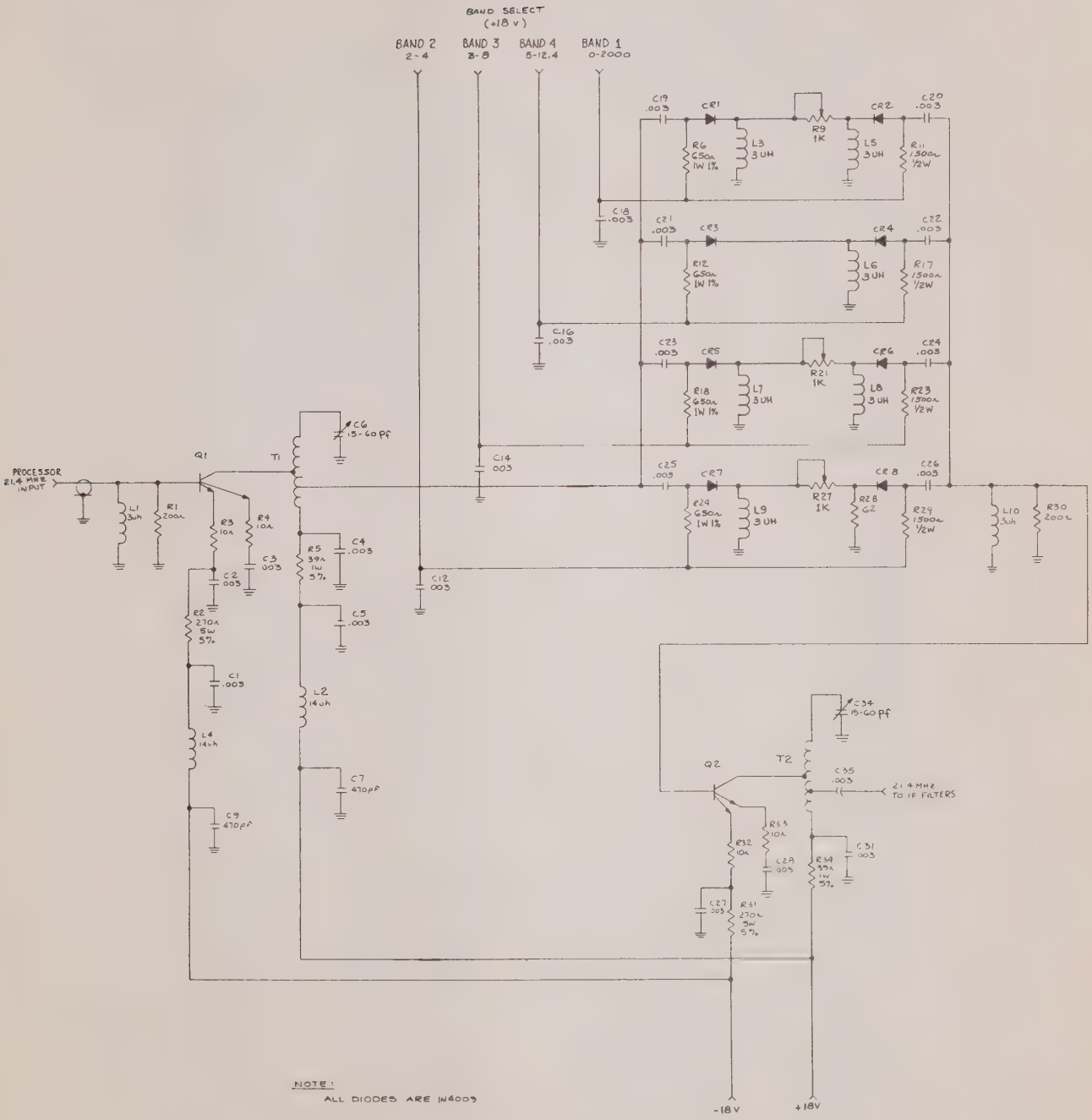


FIGURE 4-32. IF PROCESSOR (230298) (SHEET 2 OF 2)

IF PROCESSOR (230298)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 3000 pF	Centralab	DD-302
C2	Capacitor, 3000 pF	Centralab	DD-302
C3	Capacitor, 3000 pF	Centralab	DD-302
C4	Capacitor, 3000 pF	Centralab	DD-302
C5	Capacitor, 3000 pF	Centralab	DD-302
C6	Capacitor, variable, 15-60 pF	Erie	538-011-F15-60
C7	Capacitor, 470 pF		CK60AX471K
C8	Not used		
C9	Capacitor, 470 pF		CK60AX471K
C10	Not used		
C11	Not used		
C12	Capacitor, 3000 pF	Centralab	DD-302
C13	Not used		
C14	Capacitor, 3000 pF	Centralab	DD-302
C15	Not used		
C16	Capacitor, 3000 pF	Centralab	DD-302
C17	Not used		
C18	Capacitor, 3000 pF	Centralab	DD-302
C19	Capacitor, 3000 pF	Centralab	DD-302
C20	Capacitor, 3000 pF	Centralab	DD-302
C21	Capacitor, 3000 pF	Centralab	DD-302
C22	Capacitor, 3000 pF	Centralab	DD-302
C23	Capacitor, 3000 pF	Centralab	DD-302
C24	Capacitor, 3000 pF	Centralab	DD-302
C25	Capacitor, 3000 pF	Centralab	DD-302
C26	Capacitor, 3000 pF	Centralab	DD-302
C27	Capacitor, 3000 pF	Centralab	DD-302

IF PROCESSOR (230298) (cont)

Item	Description	Manufacturer	Part No.
C28	Capacitor, 3000 pF	Centralab	DD-302
C29	Not used		
C30	Not used		
C31	Capacitor, 3000 pF	Centralab	DD-302
C32	Not used		
C33	Not used		
C34	Capacitor, variable, 15-60 pF	Erie	538-011-F15-60
C35	Capacitor, 3000 pF	Centralab	DD-302
CR1	Diode		1N4009
CR2	Diode		1N4009
CR3	Diode		1N4009
CR4	Diode		1N4009
CR5	Diode		1N4009
CR6	Diode		1N4009
CR7	Diode		1N4009
CR8	Diode		1N4009
L1	Inductor, 3 μH	AILTECH	115297-4
L2	Inductor, 14 μH	AILTECH	115297-2
L3	Inductor, 3 μH	AILTECH	115297-4
L4	Inductor, 14 μH	AILTECH	115297-2
L5	Inductor, 3 μH	AILTECH	115297-4
L6	Inductor, 3 μH	AILTECH	115297-4
L7	Inductor, 3 μH	AILTECH	115297-4
L8	Inductor, 3 μH	AILTECH	115297-4
L9	Inductor, 3 μH	AILTECH	115297-4
L10	Inductor, 3 μH	AILTECH	115297-4

IF PROCESSOR (230298) (cont)

Item	Description	Manufacturer	Part No.
Q1	Transistor	AILTECH	230541-1
Q2	Transistor	AILTECH	230541-1
R1	Resistor, 200, 1/4 W		RC07GF201J
R2	Resistor, 270, 5 W, 5%	Dale	RS-5
R3	Resistor, 10, 1/4 W		RC07GF100J
R4	Resistor, 10, 1/4 W		RC07GF100J
R5	Resistor, 39, 1 W, 5%		RC32GF390J
R6	Resistor, 650, 1%, 1 W	Dale	RS-1A
R7	Not used		
R8	Not used		
R9	Resistor, variable, 1 k	Allen-Bradley	SV1021
R10	Not used		
R11	Resistor, 1.5 k, 1/2 W		RC20GF152J
R12	Resistor, 650, 1%, 1 W	Dale	RS-1A
R13	Not used		
R14	Not used		
R15	Not used		
R16	Not used		
R17	Resistor, 1.5 k, 1/2 W		RC20GF152J
R18	Resistor, 650, 1%, 1 W	Dale	RS-1A
R19	Not used		
R20	Not used		
R21	Resistor, variable, 1 k	Allen-Bradley	SV1021
R22	Not used		
R23	Resistor, 1.5 k, 1/2 W		RC20GF152J
R24	Resistor, 650, 1%, 1 W	Dale	RS-1A
R25	Not used		

Item	Description	Manufacturer	Part No.
R26	Not used		
R27	Resistor, variable, 1 k	Allen-Bradley	SV1021
R28	Resistor, 62, 1/4 W		RC07GF620J
R29	Resistor, 1.5 k, 1/2 W		RC20GF152J
R30	Resistor, 200, 1/4 W		RC07GF201J
R31	Resistor, 270, 5 W, 5%	Dale	RS-5
R32	Resistor, 10, 1/4 W		RC07GF100J
R33	Resistor, 10, 1/4 W		RC07GF100J
R34	Resistor, 39, 1 W, 5%		RC32GF390J
T1	Transformer	AILTECH	230510
T2	Transformer	AILTECH	230510

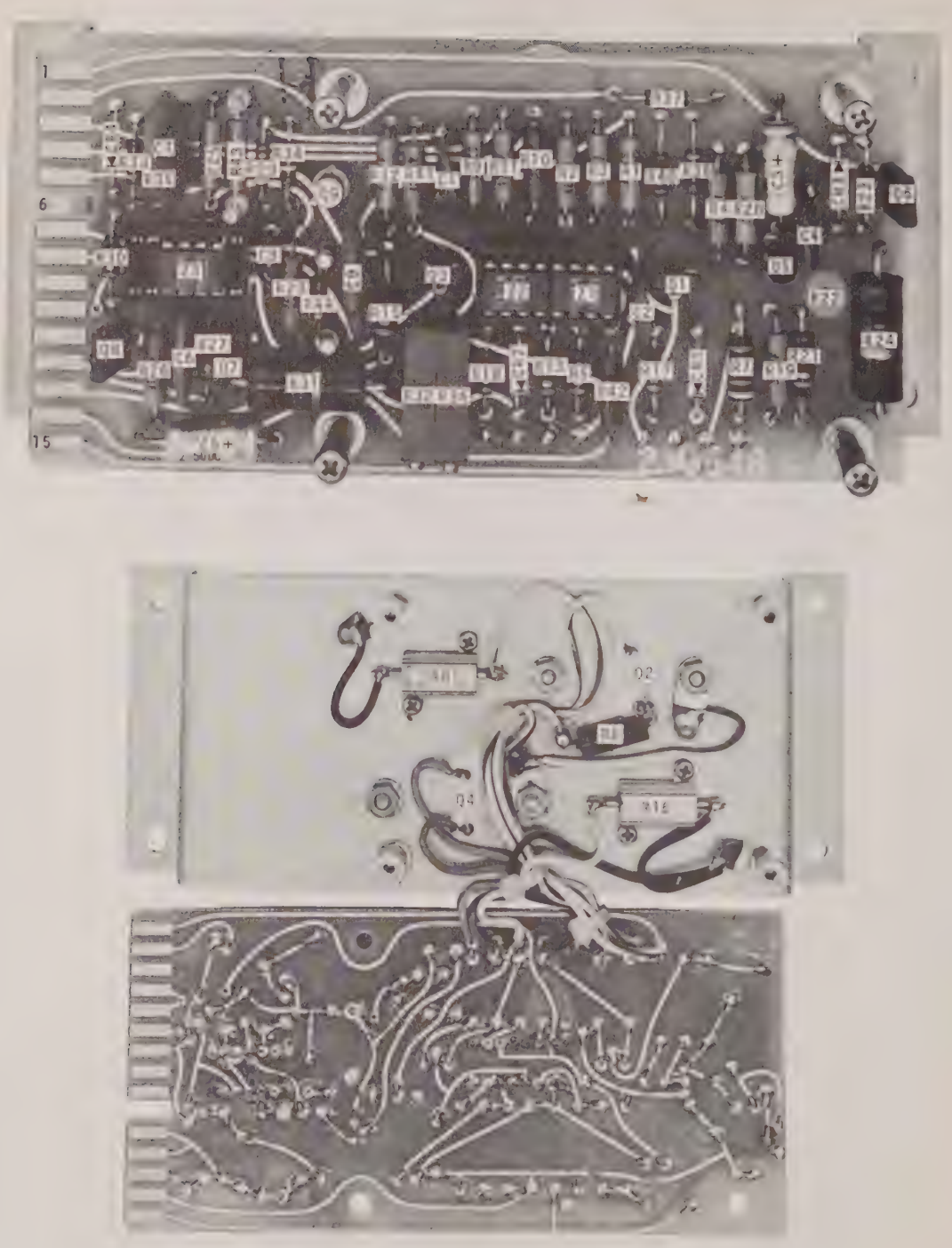
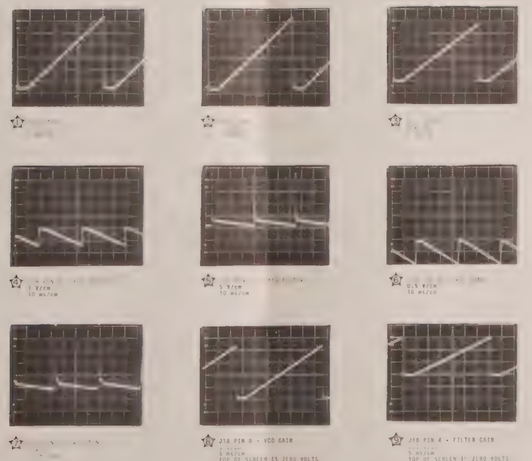


FIGURE 4-33. YIG DRIVER J18 BOARD (230547) (SHEET 1 OF 2)



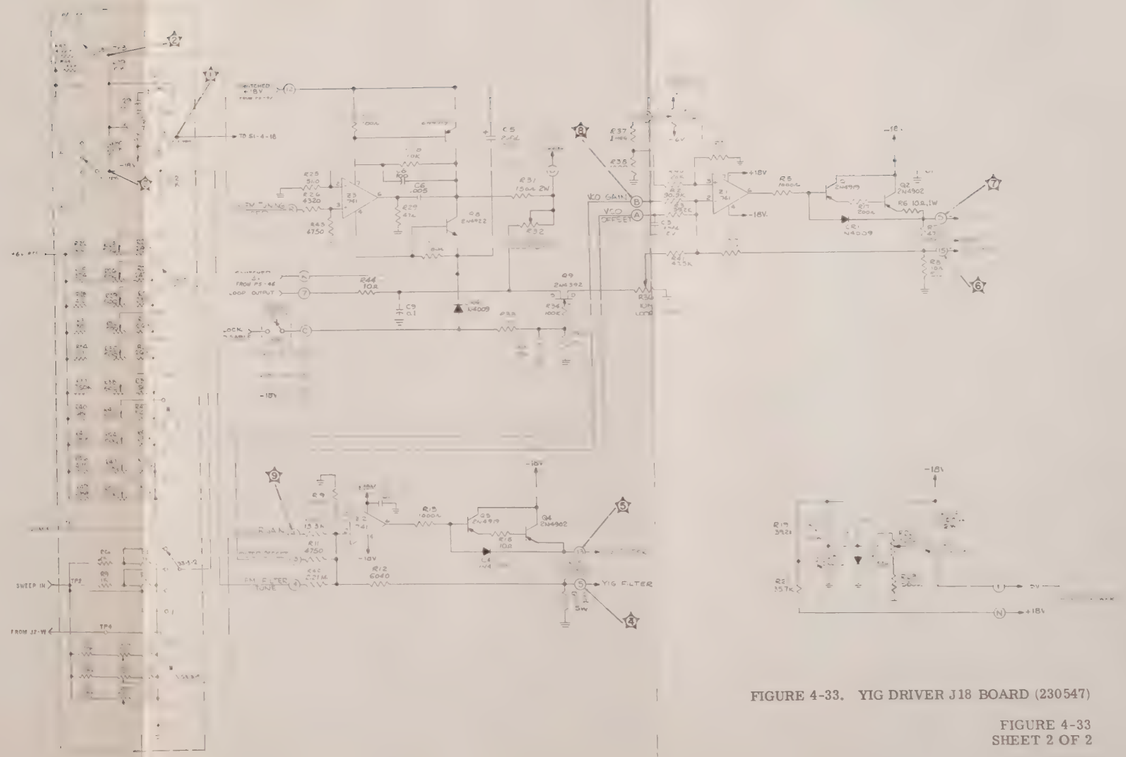


FIGURE 4-33. YIG DRIVER J18 BOARD (230547)

YIG DRIVER J18 BOARD (230547)

Item	Description	Manufacturer	Part No.
C1, C2	Capacitor, 0.01 μF	Sprague	5HKS-S10
C3	Capacitor, 10 μF, 12 V	Sprague	TE-1128
C4	Capacitor, 0.01 μF	Sprague	5HKS-S10
C5	Capacitor, 2 μF, 50 V	Sprague	TE-1301
C6	Capacitor, 0.005 μF	Centralab	DD-502
C7	Capacitor, 0.33 μF, 12 V	Sprague	HY-375
C8	Capacitor, 100 pF	Centralab	DD-101
C9	Capacitor, 0.1 μF	Centralab	DDA-104
CR1, CR2	Diode		1N4009
CR3	Diode, zener		1N753A
CR4	Diode		1N4009
Q1	Transistor		2N4919
Q2	Transistor		2N4902
Q3	Transistor		2N4919
Q4	Transistor		2N4902
Q5	Transistor		2N4126
Q6, Q7	Transistor		2N4919
Q8	Transistor		2N4922
Q9	Transistor		2N4392
R1	Resistor, 5.11 k, 1/8 W		RN60C5111F
R2	Resistor, 90.9 k, 1/8 W		RN60C9092F
R3	Resistor, 39.2 k, 1/8 W		RN60C3922F
R4	Resistor, 10 k, 1/8 W		RN60C1002F
R5	Resistor, 1 k, 1/4 W		RC07GF102J
R6	Resistor, 10, 1 W		RC32GF100J
R7	Resistor, 4.7 k, 1/2 W		RC20GF472J
R8	Resistor, 10, 5 W, 1%	Dale	RE60G10R1

YIG DRIVER J18 BOARD (230547) (cont)

Item	Description	Manufacturer	Part No.
R9	Resistor, 5.11 k, 1/8 W		RN60C5111F
R10	Resistor, 13.3 k, 1/8 W		RN60C1332F
R11	Resistor, 4.75 k, 1/8 W		RN60C4751F
R12	Resistor, 6.04 k, 1/8 W		RN60C6041F
R13	Resistor, 1 k, 1/4 W		RC07GF102J
R14	Not used		
R15	Resistor, 560, 1/2 W		RC20GF561J
R16	Resistor, 10, 5 W, 1%	Dale	RE60G10R0
R17	Resistor, 200, 1/4 W		RC07GF201J
R18	Resistor, 10, 1/4 W		RC07GF100J
R19	Resistor, 39.2 k, 1/8 W		RN60C3922F
R20	Resistor, 35.7 k, 1/8 W		RN60C3572F
R21	Resistor, 1 k, 1/2 W		RC20GF102J
R22	Resistor, variable, 100	Bourns	3339P-1-101
R23	Resistor, 560, 1/4 W		RC07GF561J
R24	Resistor, 100, 2 W		RC42GF101J
R25	Resistor, 5.11 k, 1/8 W		RN60C5111F
R26	Resistor, 4.32 k, 1/8 W		RN60C4321F
R27	Resistor, 180, 1/4 W		RC07GF181J
R28	Resistor, 10 k, 1/8 W		RN60C1002F
R29	Resistor, 47, 1/4 W		RC07GF470J
R30	Resistor, 180, 1/4 W		RC07GF181J
R31	Resistor, 150, 2 W		RC42GF151J
R32	Resistor, variable, 100	Bourns	3009P-1-101
R33	Resistor, 1 meg, 1/4 W		RC07GF105J
R34	Resistor, 100 k, 1/4 W		RC07GF104J
R35	Resistor, 1 meg, 1/4 W		RC07GF105J

YIG DRIVER J18 BOARD (230547) (cont)

Item	Description	Manufacturer	Part No.
R36	Resistor, variable, 10 k	Bourns	3009P-1-103
R37	Resistor, 1 meg, 1/4 W		RC07GF105J
R38	Resistor, 1 k, 1/4 W		RC07GF102J
R39	Not used		
R40	Resistor, 20 k, 1/4 W		RC07GF203J
R41	Resistor, 47.5 k, 1/8 W		RN60C4752F
R42	Resistor, 2.21 meg, 1/8 W		RN60C2214F
R43	Resistor, 4.75*k, 1/8 W		RN60C4751F
R44	Resistor, 10, 1/4 W		RC07GF100J
Z1, Z2, Z3	IC	TI	SN72741P

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* Resistor value selected at test during manufacture.

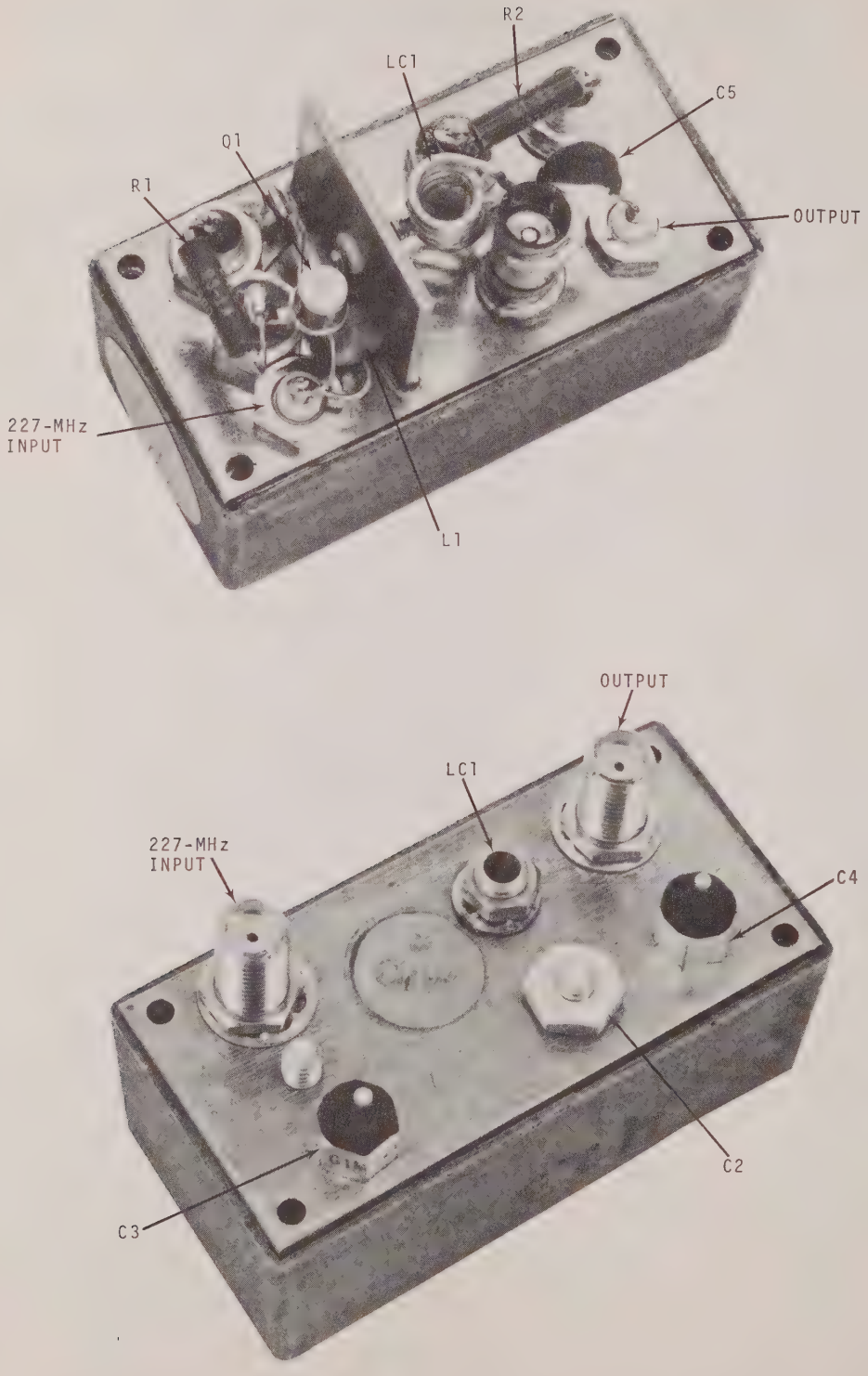


FIGURE 4-34. RF AMPLIFIER (230625) (SHEET 1 OF 2)

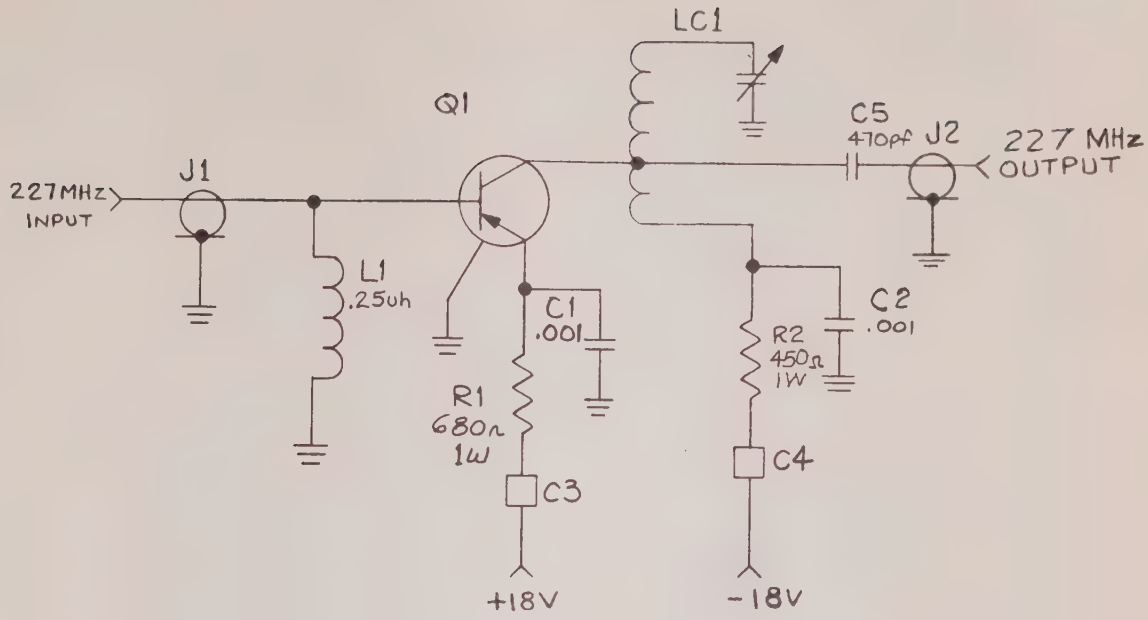


FIGURE 4-34. RF AMPLIFIER (230625) (SHEET 2 OF 2)

RF AMPLIFIER ASSEMBLY (230625)

Item	Description	Manufacturer	Part No.
C1	Capacitor, standoff, 1000 pF	AILTECH	208674-2
C2	Capacitor, standoff, 1000 pF	AILTECH	208674-2
C3	Capacitor, filter	Glennite	MF204
C4	Capacitor, filter	Glennite	MF204
C5	Capacitor, disc, 470 pF		CK60AX471K
L1	Inductor, fixed, 0.25 μH	AILTECH	115297-1
LC1	Tank circuit	JFD	LC-374
Q1	Transistor	AILTECH	230541-5
R1	Resistor, 680, 1 W, ±5%	Dale	RS-1A
R2	Resistor, 450, 1 W, ±5%	Dale	RS-1A

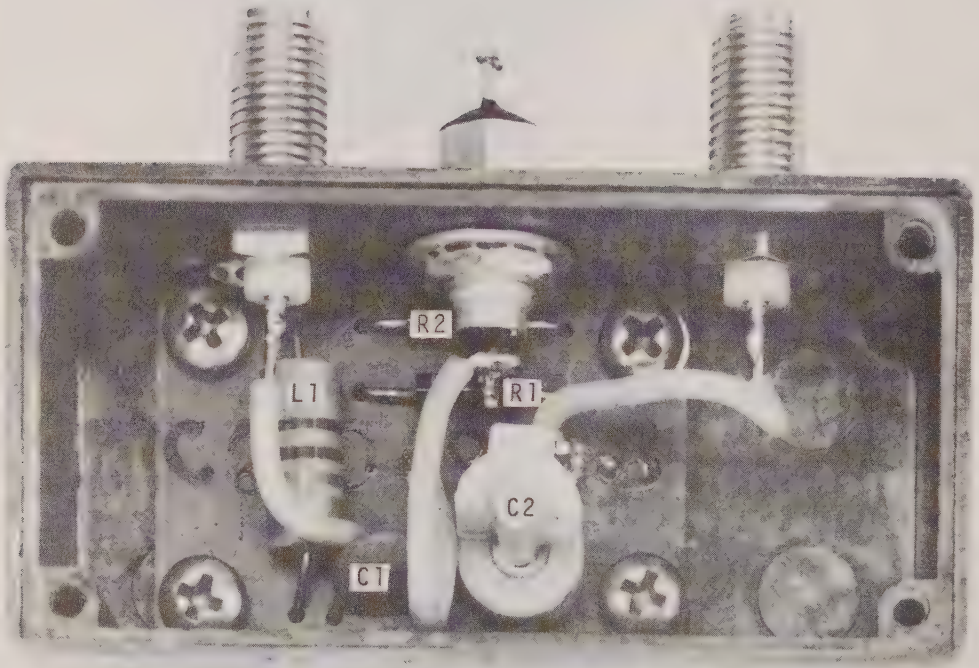


FIGURE 4-35. MIXER BIAS (230500) (SHEET 1 OF 2)

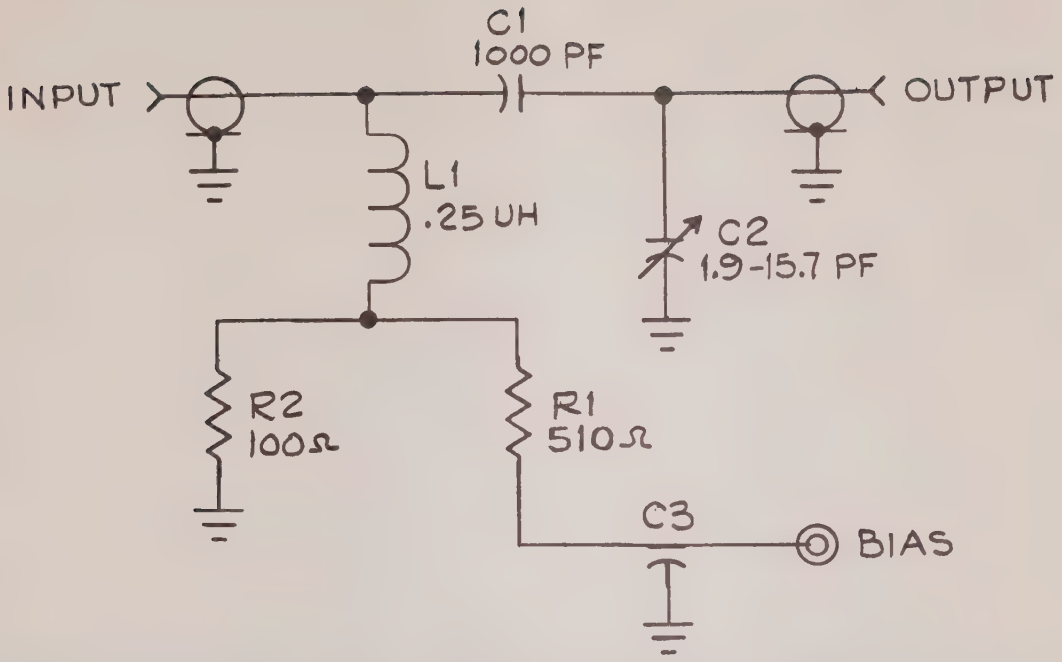


FIGURE 4-35. MIXER BIAS (230500) (SHEET 2 OF 2)

MIXER BIAS (230500)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 1000 pF		CK60AW102M
C2	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
C3	Capacitor, filter	Glennite	MF204
L1	Inductor, 0.25 μH	AILTECH	115297-1
R1	Resistor, 510, 1/4 W		RC07GF511J
R2	Resistor, 100, 1/4 W		RC07GF101J

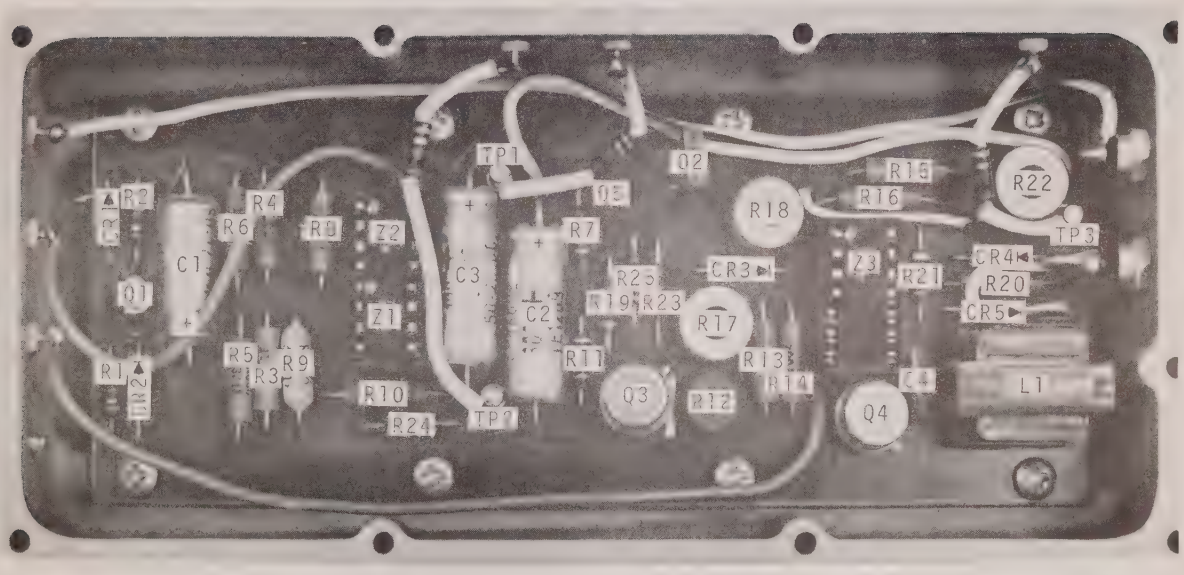
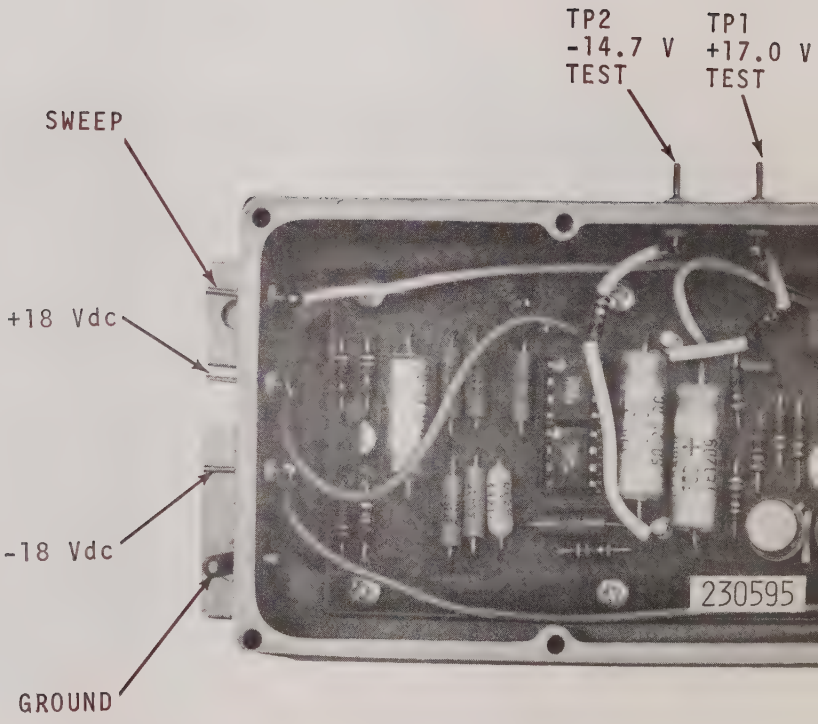


FIGURE 4-37. LCVCO SHAPER (230595) (SHEET 1 OF 2)


TP2
-14.7 V
TEST
TP1
+17.0 V
TEST
SWEEP
+18 Vdc
-18 Vdc
GROUND
230595

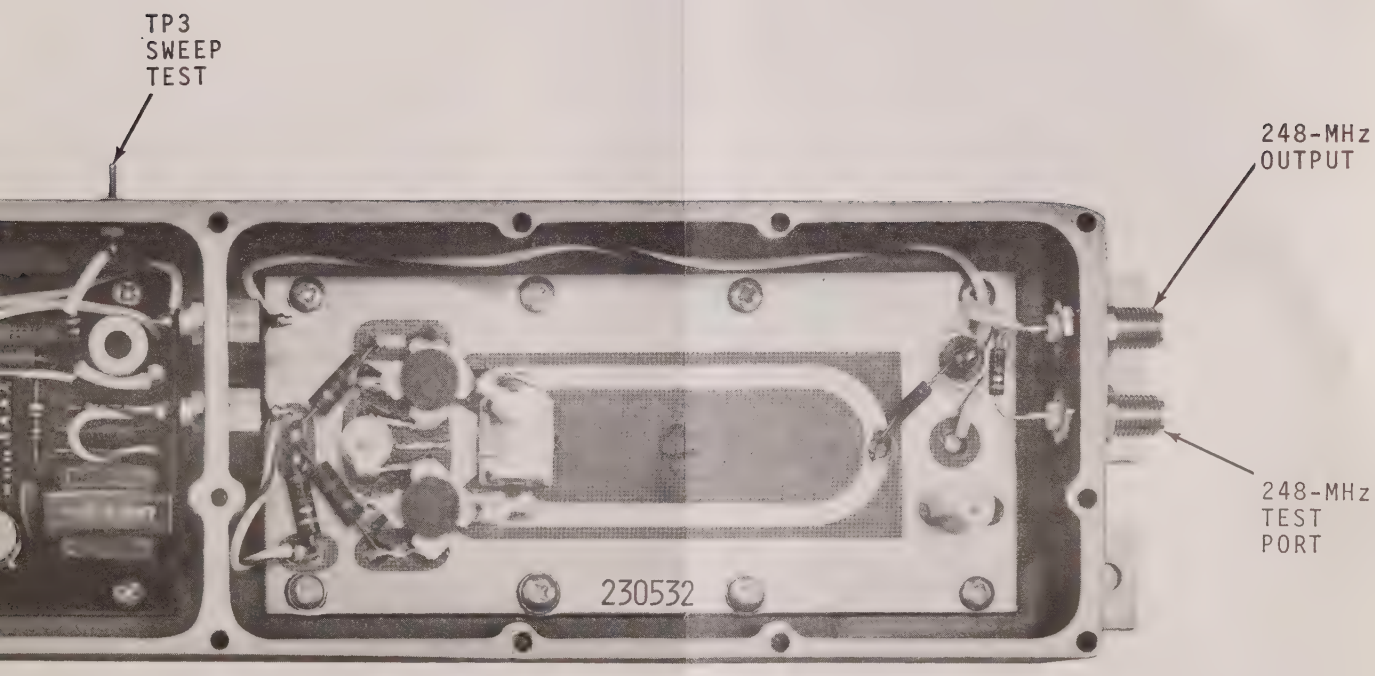


FIGURE 4-36. LCVCO ASSEMBLY (230543)

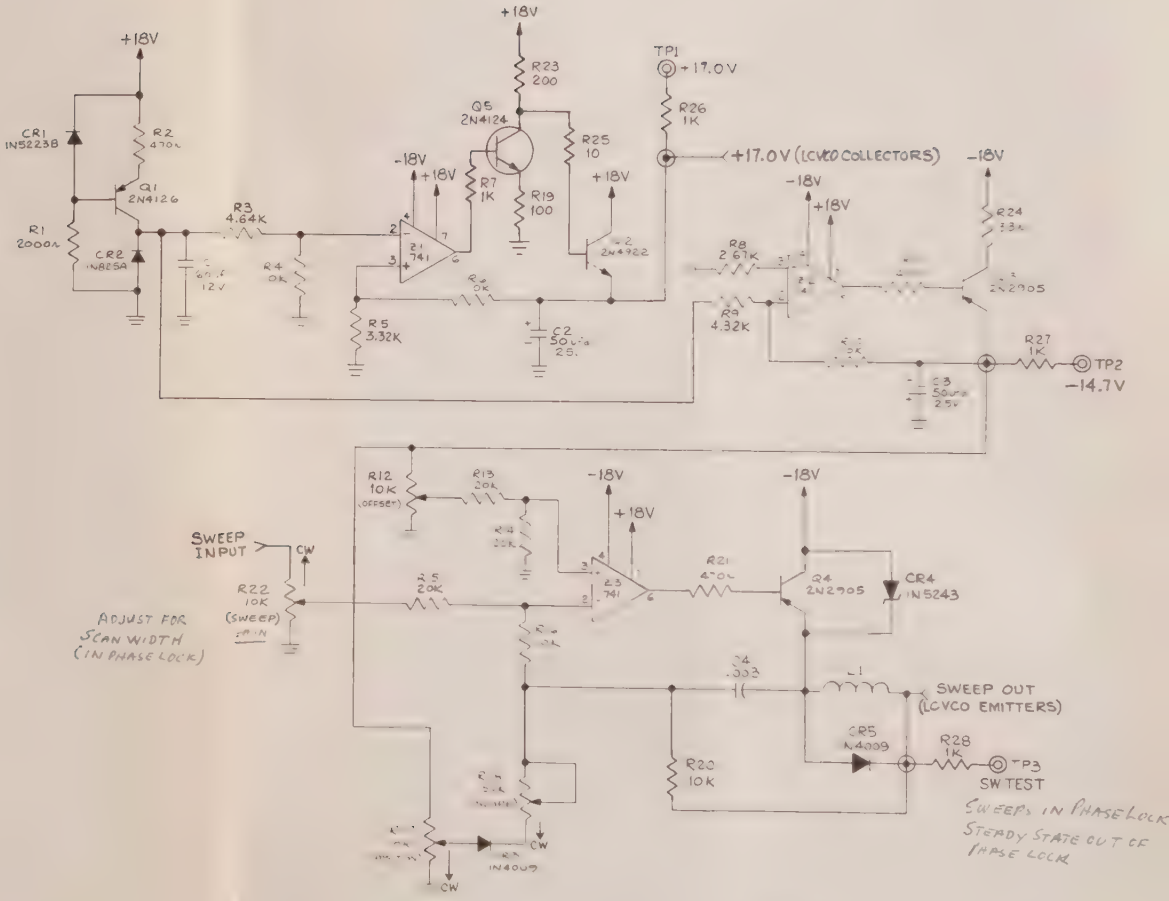


FIGURE 4-37. LCVCO SHAPER (230595)

FIGURE 4-37
SHEET 2 OF 2

LCVCO SHAPER (230595)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 60 μFd, 12 V	Sprague	TE-1133.5
C2	Capacitor, 50 μF, 25 V	Sprague	TE-1209
C3	Capacitor, 50 μF, 25 V	Sprague	TE-1209
C4	Capacitor, 0.003 μF	Centralab	DD-302
CR1	Diode		1N5223B
CR2	Diode, 1%		1N825A
CR3	Diode		1N4009
CR4	Diode		1N5243
CR5	Diode		1N4009
L1	Inductor	EDKO	E2409
Q1	Transistor		2N4126
Q2	Transistor		2N4922
Q3	Transistor		2N2905
Q4	Transistor		2N2905
Q5	Transistor		2N4124
R1	Resistor, 2 k, 1/4 W		RC07GF202J
R2	Resistor, 470, 1/4 W		RC07GF471J
R3	Resistor, 4.64 k, 1/8 W		RN60C4641F
R4	Resistor, 10 k, 1/8 W		RN60C1002F
R5	Resistor, 3.32 k, 1/8 W		RN60C3321F
R6	Resistor, 10 k, 1/8 W		RN60C1002F
R7	Resistor, 1 k, 1/4 W		RC07GF102J
R8	Resistor, 2.67 k, 1/8 W		RN60C2671F
R9	Resistor, 4.32 k, 1/8 W		RN60C4321F
R10	Resistor, 10 k, 1/8 W		RN60C1002F
R11	Resistor, 470, 1/4 W		RC07GF471J

LCVCO SHAPER (230595) (cont)

Item	Description	Manufacturer	Part No.
R12	Resistor, variable, 10 k	Bourns	3339P-1-103
R13	Resistor, 20 k, 1/8 W		RN60C2002F
R14	Resistor, 20 k, 1/8 W		RN60C2002F
R15	Resistor, 20 k, 1/8 W		RN60C2002F
R16	Resistor, 10 k, 1/8 W		RN60C1002F
R17	Resistor, variable, 10 k	Allen-Bradley	SV1031
R18	Resistor, variable, 50 k	Allen-Bradley	SV5031
R19	Resistor, 100, 1/4 W		RC07GF101J
R20	Resistor, 10 k, 1/8 W		RN60C1002F
R21	Resistor, 470, 1/4 W		RC07GF471J
R22	Resistor, variable, 10 k	Allen-Bradley	SV1031
R23	Resistor, 200, 1/4 W		RC07GF201J
R24	Resistor, 33, 1/4 W		RC07GF330J
R25	Resistor, 10, 1/4 W		RC07GF100J
Z1	IC	TI	SN72741P
Z2	IC	TI	SN72741P
Z3	IC	TI	SN72741P

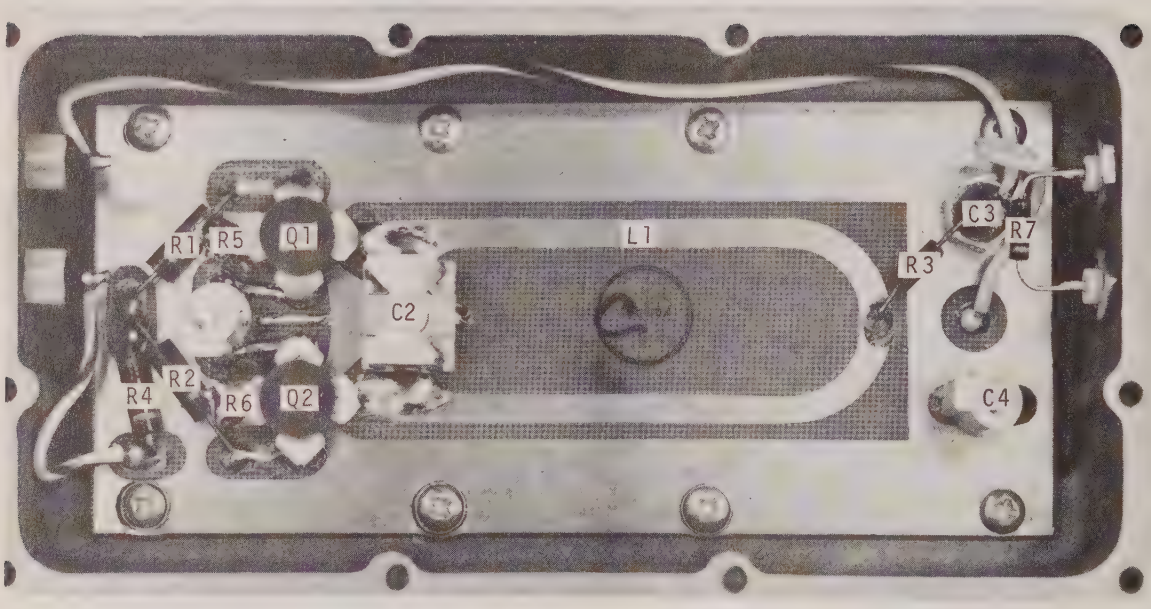


FIGURE 4-38. LCVCO OSCILLATOR II (230532) (SHEET 1 OF 2)

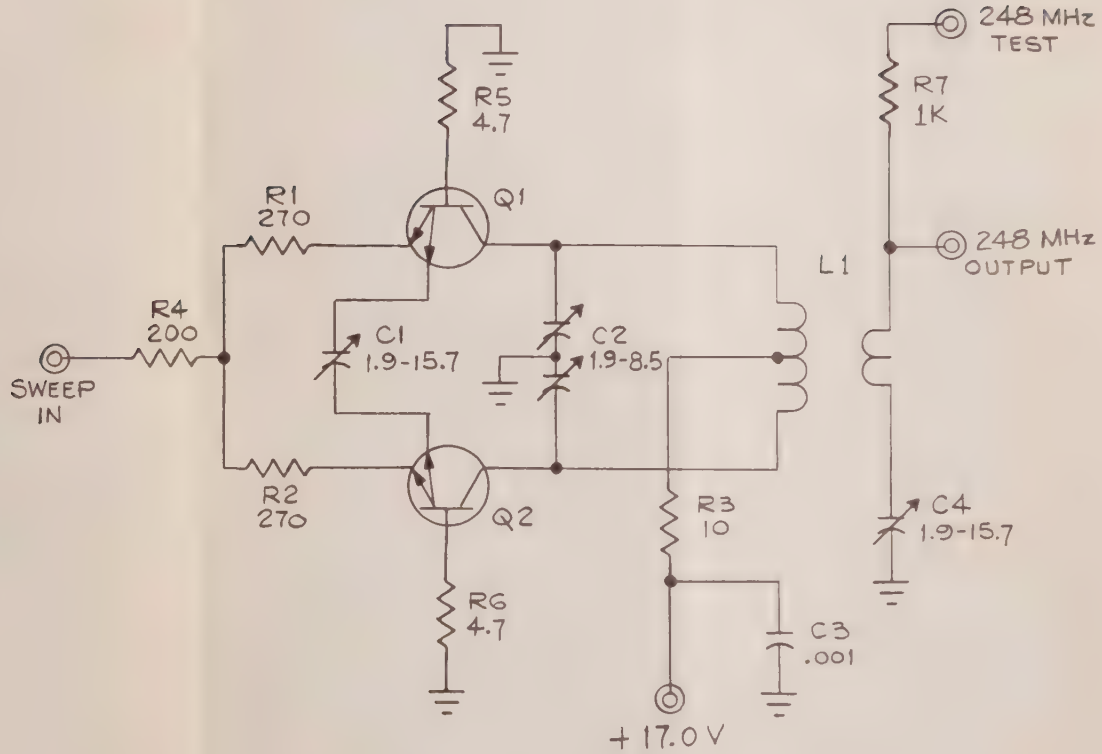


FIGURE 4-38. LCVCO OSCILLATOR II (230532)

LCVCO OSCILLATOR II (230532)

Item	Description	Manufacturer	Part No.
C1	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
C2	Capacitor, variable, 1.9-8.5 pF	E.F. Johnson	189-253-5
C3	Capacitor, standoff, 1000 pF	AILTECH	208674-2
C4	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
Q1	Transistor	AILTECH	230541-1
Q2	Transistor	AILTECH	230541-1
R1	Resistor, 270, 1/2 W		RC20GF271J
R2	Resistor, 270, 1/2 W		RC20GF271J
R3	Resistor, 10, 1/4 W		RC07GF100J
R4	Resistor, 200, 1/2 W		RC20GF201J
R5	Resistor, 4.7, 1/8 W		RC05GF4R7J
R6	Resistor, 4.7, 1/8 W		RC05GF4R7J

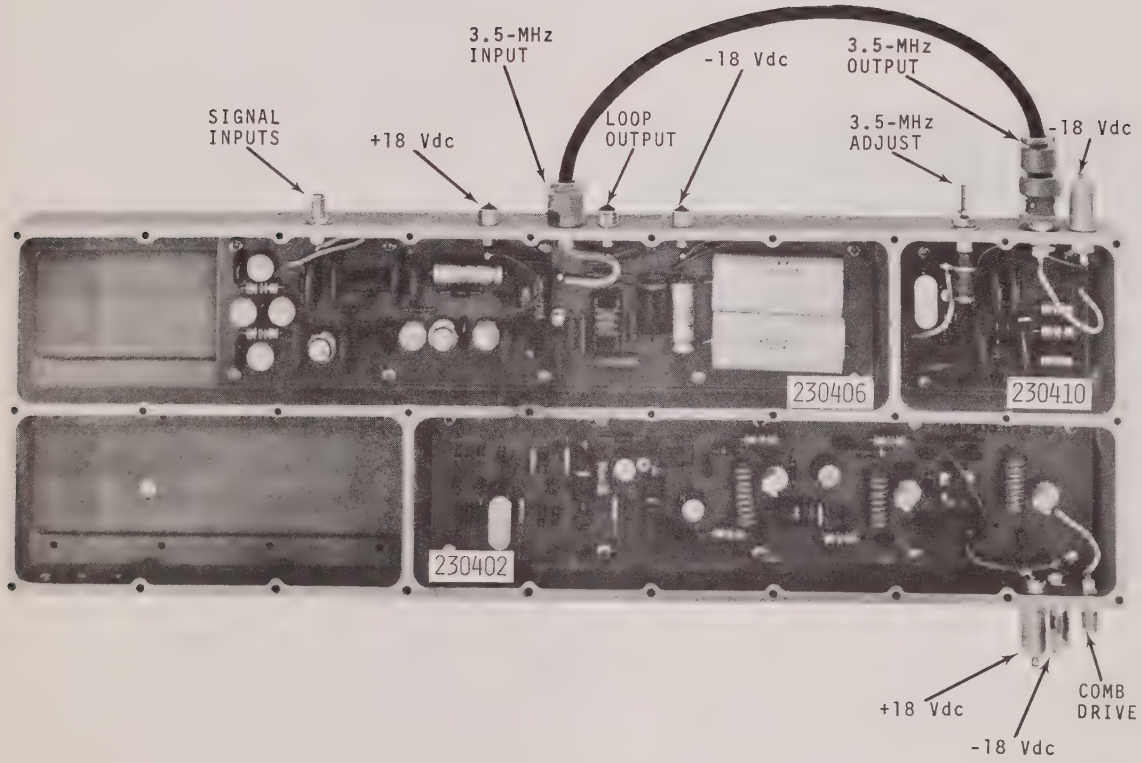


FIGURE 4-39. LOOP ASSEMBLY (230392)

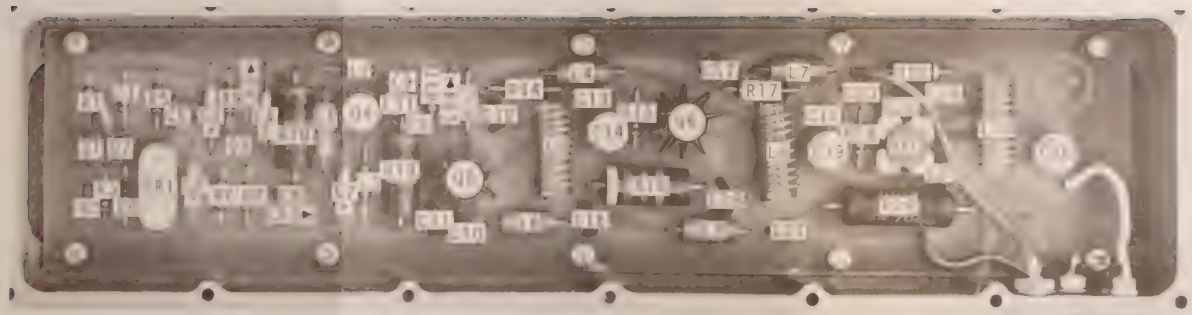


FIGURE 4-40. COMB SOURCE (230402) (SHEET 1 OF 2)

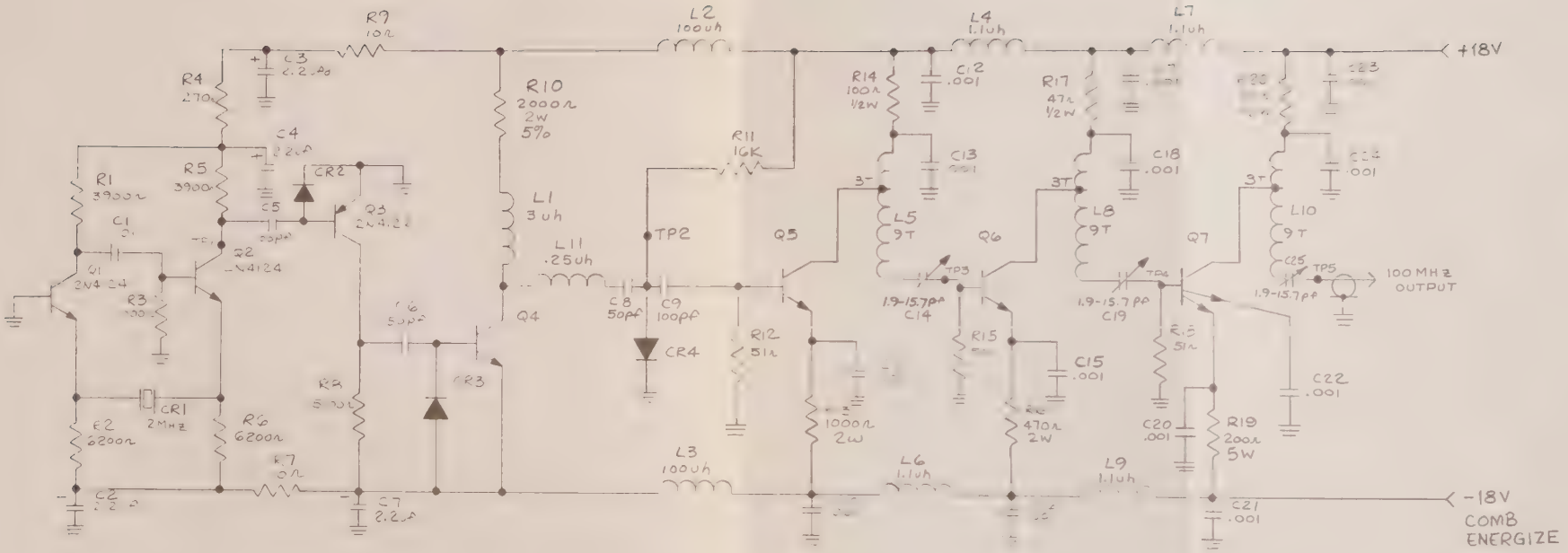


FIGURE 4-40. COMB SOURCE (230402)

COMB SOURCE (230402)

Item	Description	Manufacturer	Part No.
C1	Capacitor, 0.01 μF	Sprague	5HKS-S10
C2, C3, C4	Capacitor, 2.2 μF	Sprague	CS13BE225K
C5	Capacitor, 100 pF	Centralab	DD-101
C6	Capacitor, 50 pF	Centralab	DD-500
C7	Capacitor, 2.2 μF	Sprague	CS13BE225K
C8	Capacitor, 50 pF	Centralab	DD-500
C9	Capacitor, 100 pF	Centralab	DD-101
C10 thru C13	Capacitor, 0.001 μF		CK60AW102M
C14	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
C15 thru C18	Capacitor, 0.001 μF		CK60AW102M
C19	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
C20 thru C24	Capacitor, 0.001 μF		CK60AW102M
C25	Capacitor, variable, 1.9-15.7 pF	E.F. Johnson	187-0109-5
CR1	Crystal, 2 MHz	AILTECH	230479-3
CR2, CR3	Diode	AILTECH	230542-1
CR4	Diode	AILTECH	230542-2
L1	Inductor, 3 μH	Jeffers	115297-4
L2, L3	Inductor, 100 μH	J.W. Miller	70F104A1
L4	Inductor, 1.1 μH	Jeffers	115297-3
L5	Inductor, fixed	AILTECH	230529-1
L6, L7	Inductor, 1.1 μH	Jeffers	115297-3
L8	Inductor, fixed	AILTECH	230529-1

COMB SOURCE (230402) (cont)

Item	Description	Manufacturer	Part No.
L9	Inductor, 1.1 μH	Jeffers	115297-3
L10	Inductor, fixed	AILTECH	230529-1
L11	Inductor, 0.25 μH	AILTECH	115297-1
Q1, Q2	Transistor		2N4124
Q3	Transistor		2N4126
Q4, Q5, Q6	Transistor	AILTECH	230541-2
Q7	Transistor	AILTECH	230541-1
R1	Resistor, 3.9 k, 1/4 W		RC07GF392J
R2	Resistor, 6.2 k, 1/4 W		RC07GF622J
R3	Resistor, 1 k, 1/4 W		RC07GF102J
R4	Resistor, 270, 1/4 W		RC07GF271J
R5	Resistor, 3.9 k, 1/4 W		RC07GF392J
R6	Resistor, 6.2 k, 1/4 W		RC07GF622J
R7	Resistor, 10, 1/4 W		RC07GF100J
R8	Resistor, 5.1 k, 1/4 W		RC07GF512J
R9	Resistor, 10, 1/4 W		RC07GF100J
R10	Resistor, 2 k, 2 W		RC42GF202J
R11	Resistor, 16 k, 1/4 W		RC07GF163J
R12	Resistor, 51, 1/4 W		RC07GF510J
R13	Resistor, 1 k, 2 W		RC42GF102J
R14	Resistor, 100, 1/2 W		RC20GF101J
R15	Resistor, 51, 1/4 W		RC07GF510J
R16	Resistor, 470, 2 W		RC42GF471J
R17	Resistor, 47, 1/2 W		RC20GF470J
R18	Resistor, 51, 1/4 W		RC07G510J
R19	Resistor, 200, 5 W, 5%	Dale	RS-5
R20	Resistor, 20, 1/2 W		RC20GF200J

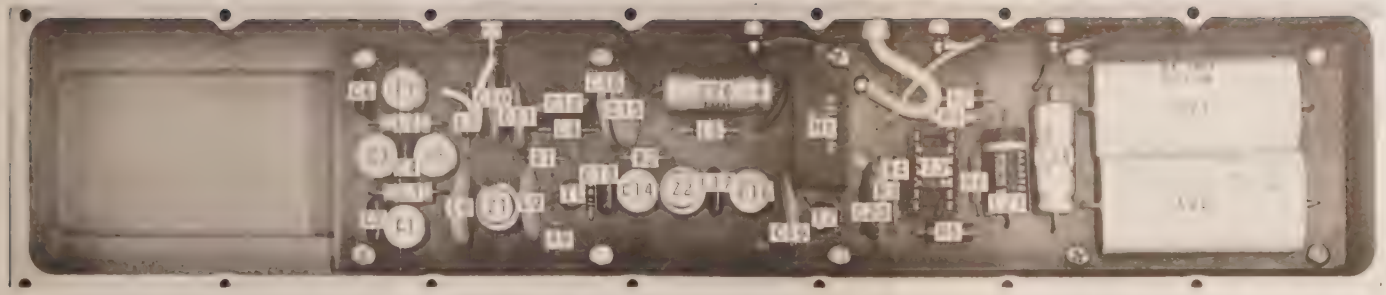


FIGURE 4-41. LOOP CONTROL (230406) (SHEET 1 OF 2)

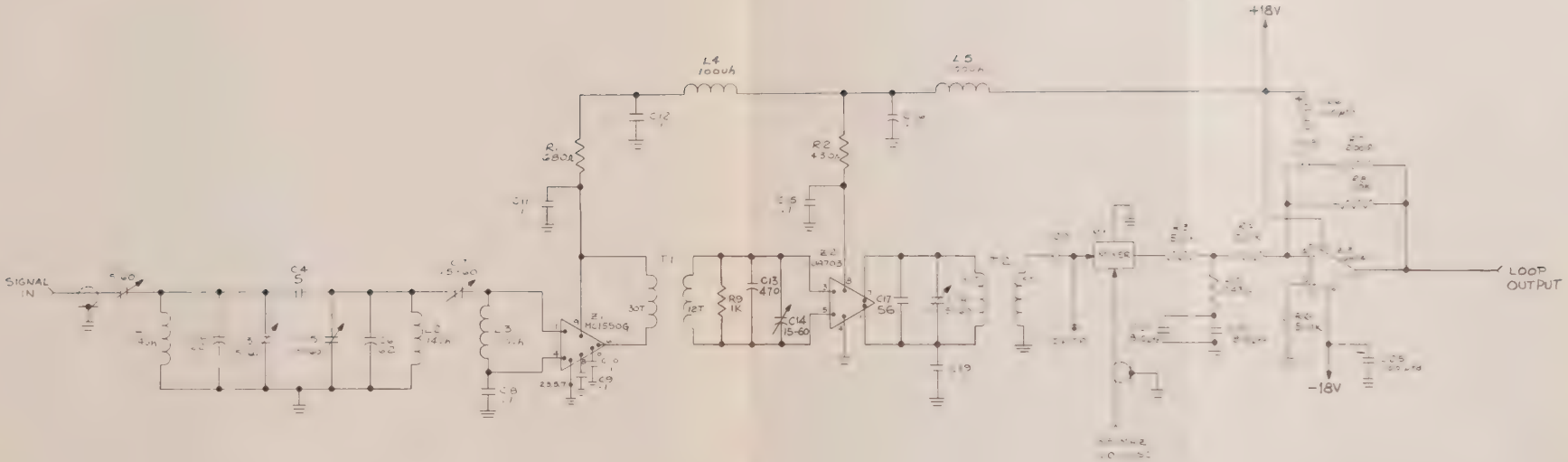


FIGURE 4-41. LOOP CONTROL (230406)

FIGURE 4-41

SHEET 2 OF 2

LOOP CONTROL (230406)

Item	Description	Manufacturer	Part No.
C1	Capacitor, variable, 15-60 pF	Erie	538-011F15-60
C2	Capacitor, 62 pF, ±5%	Elmenco	DM-15-620J
C3	Capacitor, variable 15-60 pF	Erie	538-011F15-60
C4	Capacitor, 5 pF, ±5%	Elmenco	DM-15-050J
C5	Capacitor, variable 15-60 pF	Erie	538-011F15-60
C6	Capacitor, 62 pF, ±5%	Elmenco	DM-15-620J
C7	Capacitor, variable 15-60 pF	Erie	538-011F15-60
C8	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C9	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C10	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C11	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C12	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C13	Capacitor, 470 pF, ±5%	Elmenco	DM-15-471J
C14	Capacitor, variable 15-60 pF	Erie	538-011F15-60
C15	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C16	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C17	Capacitor, 56 pF, ±5%	Elmenco	DM-15-560J
C18	Capacitor, variable 15-60 pF	Erie	538-011F15-60
C19	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C20	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C21	Capacitor, 8.0 μF, ±10%, 100 V	GE	BA-19A805A
C22	Capacitor, 8.0 μF, ±10%, 100 V	GE	BA-19A805A

LOOP CONTROL (230406) (cont)

Item	Description	Manufacturer	Part No.
C23	Capacitor, 0.1 μF, 200 V	Aerovox	P8292ZN10
C24	Not used		
C25	Capacitor, 100 μF, 25 V	Sprague	TE-1211
C26	Capacitor, 100 μF, 25 V	Sprague	TE-1211
L1	Inductor, 14 μH	AILTECH	115297-2
L2	Inductor, 14 μH	AILTECH	115297-2
L3	Inductor, 100 μH	J. W. Miller	70F104A1
L4	Inductor, 100 μH	J. W. Miller	70F104A1
L5	Inductor, 100 μH	J. W. Miller	70F104A1
M1	Mixer	Relcom	MGL
R1	Resistor, 680, 1/4 W		RC07GF681J
R2	Resistor, 430, 1/4 W		RC07GF431J
R3	Resistor, 5.11 k, 1/8 W		RN60C5111F
R4	Resistor, 5.11 k, 1/8 W		RN60C5111F
R5	Resistor, 243, 1/8 W		RN60C2430F
R6	Resistor, 5.11 k, 1/8 W		RN60C5111F
R7	Resistor, 200, 1/8 W		RN60C2000F
R8	Resistor, 10 k, 1/8 W		RN60C1002F
R9	Resistor, 1 k, 1/4 W		RC07GF102J
T1	Transformer	AILTECH	230531-1
T2	Transformer	AILTECH	230531-2
Z1	IC	Motorola	MC1550G
Z2	IC	Fairchild	U5D770339X
Z3	IC	TI	SN72741P

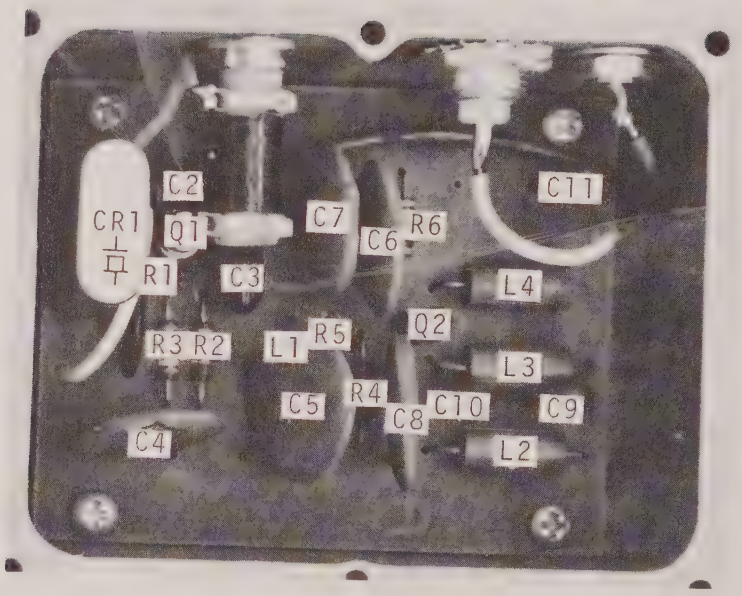


FIGURE 4-42. 3.5-MHz OSCILLATOR (230410) (SHEET 1 OF 2)

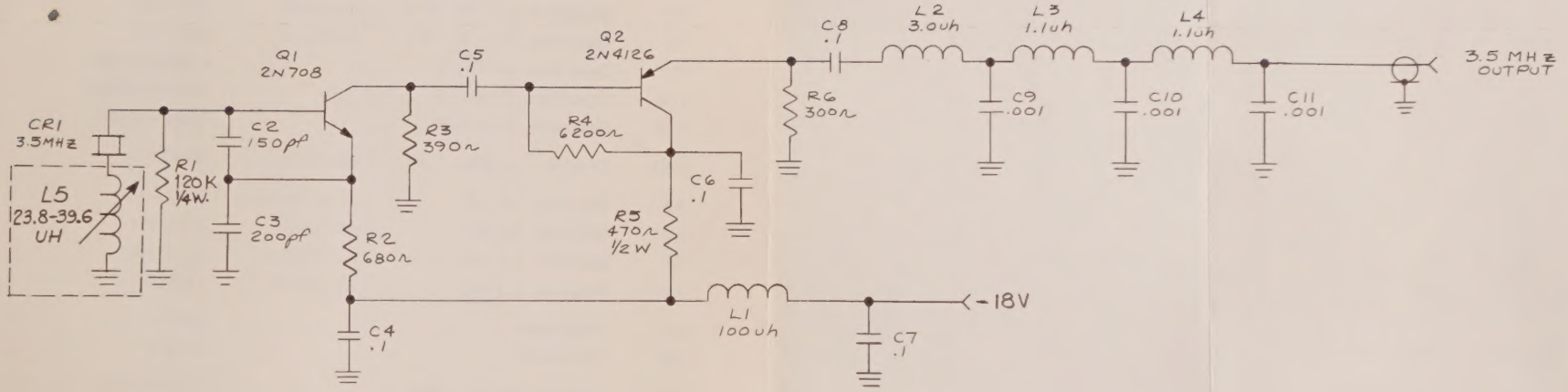


FIGURE 4-42. 3.5-MHz OSCILLATOR (230410)

3.5 MHz OSCILLATOR (230410)

Item	Description	Manufacturer	Part No.
C1	Not used		
C2	Capacitor, 150 pF ±10%	Elmenco	DM-15-151K
C3	Capacitor, 200 pF ±10%	Elmenco	DM-15-201K
C4	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C5	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C6	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C7	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C8	Capacitor, 0.1 μF, 75 V	Centralab	DDA-104
C9	Capacitor, 0.001 μF		CK60AW102M
C10	Capacitor, 0.001 μF		CK60AW102M
C11	Capacitor, 0.001 μF		CK60AW102M
CR1	Crystal, 3.5 MHz	AILTECH	230479-4
L1	Inductor, 100 μH	J. W. Miller	70F104A1
L2	Inductor, 3.0 μH	AILTECH	115297-4
L3	Inductor, 1.1 μH	AILTECH	115297-3
L4	Inductor, 1.1 μH	AILTECH	115297-3
Q1	Transistor		2N708
Q2	Transistor		2N4126
R1	Resistor, 120 k, 1/4 W		RC07GF124J
R2	Resistor, 680, 1/4 W		RC07GF681J
R3	Resistor, 390, 1/4 W		RC07GF391J
R4	Resistor, 6.2 k, 1/4 W		RC07GF622J
R5	Resistor, 470, 1/2 W		RC20GF471J
R6	Resistor, 300, 1/4 W		RC07GF301J

AILTECH
A CUTLER-HAMMER COMPANY
CONTROL

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